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*THE LANGUAGE OF HAWAII.**

I.

ENGAGED in the work of geodesy and astronomy, the author of this paper made several trips to the Hawaiian Islands. Although little attention could be given to ethnological or linguistic studies on account of professional duties, contact with the natives incidentally brought out points which seemed interesting.

Struck by the occurrence of peculiar grammatical forms, and finding unusual mental habits among the Kanakas induced by their ethical ideas, it was thought worth while to briefly note these facts. Parallels have been drawn between Polynesian and European constructions, and, as bearing on the formation of language, some incidents are related illustrating characteristic lines of thought.

Grateful acknowledgment is here made to Dr. Cyrus Adler of the Smithsonian Institution, for valuable suggestions as to the arrangement of the material.

I.—INTRODUCTION.

Geographical Limits of Languages considered.—The establishment of the Oceanic family of speech has been characterized by Max Müller as one of the most brilliant discoveries in the science of language. Both on account of the wide geographical limits involved and the scanty basis of com-

*Read before the Philosophical Society of Washington.

parison, a study of these groups is beset with difficulties. Think of the immense space and time separating the localities and occurrences. From New Zealand on the south to Formosa on the north; from Easter Island on the east to Madagascar on the west, covering a territory of 208° of longitude and 88° of latitude—nearly one-fourth the habitable surface of the globe—we find a root language governed by the same grammatical system and pervaded by the same modes of thought. We shall have occasion later to point out certain peculiarities which are common to all the Oceanic languages, but which are radically distinct from any branch of the Indo-European family, showing that Oceanic speech, in the great struggle of the race to acquire an instrument of analysis, has been developed from a fundamental, separate type, and in its origin had nothing in common with the stock to which European tongues are referred. Between some of the islands there has been no contact for thousands of years; yet their linguistic connection is unmistakable and everything points to derivation from a common source. They have the same customs and mythology; the laws of euphony regulating the change from one consonant to another are fixed and uniform; the mold into which sentences are cast, the co-ordination of phrases, the mutual dependence of ideas, all reflect the thought habits of an identical race.

Classification of Oceanic Languages.—The Hawaiian is one branch of the Polynesian group of the great Oceanic family. An analysis of the structure shows that six groups can be logically defined, namely, the Polynesian, Micronesian, Papuan, Australian, Malayan, and the Malagasy. Each one of these embraces distinct branches, having close affinities with one another. For example, the Polynesian includes the language of Hawaii, Fiji, Samoa, Marquesas, and Tahiti. The Micronesian comprises the Gilbert, Marshall, and Caroline Islands; and so on through all the members of the family, ending with Madagascar, which is the center and type of the Malagasy group. When we consider that this vast territory of speech, from America on the east to Africa on the west, with its families, groups, branches, and dialects almost numberless, has been reduced to a permanent and philosophical system of syntax, we do not wonder that one of the most profound students of comparative philology refers to the achievement as a discovery of the greatest importance.

Dispersion of Terms.—Before passing to an analysis of Hawaiian speech, one word on the theory of dispersion. It is admitted that all the Oceanic languages were derived from one very ancient tongue, now lost. The Malagasy has felt the influence of the Arabic, and the Malay shows unmistakable contact with the Sanskrit; yet the great tidal wave of emigration, which was ever from west to east in the Pacific, swept on and preserved intact the structural features of the original form. The theory that each dialect has an indigenous base, and that words common to all were introduced through commercial intercourse, is entirely inadequate. In the first place, the connection was far too slight to produce the effect mentioned, and in the next place the common words are not those ingrafted and absorbed by intercourse, but are such as are in every known language—the oldest and the commonest. When the Normans came to England they introduced many words; but they could not displace those simple names of natural objects as sun, moon, etc., nor those indicating intimate family relations, such as father, mother, brother, sister—terms always dear to the heart of humanity and jealously guarded against foreign intrusion and corruption. Just so in the Pacific. The words common to all branches of the group are those which from the very

nature of things must have been in use from time immemorial. This fact alone explodes the theory that the dispersion of terms was the result of intercourse. It is confidently believed by some philologists that the old Egyptian word *ra* (the sun) is still preserved in the *la* of Hawaii, as in Hale-a-ka-la, meaning the house of the sun; *l* and *r* are still interchangeable in Hawaii, and the word being not only one of the commonest, but also associated with certain forms of worship, has tenaciously held its place through all the varying influence of ages.

The original home of the Polynesian race was one of the Malay islands—probably Sumatra—and the modern Hawaiians exhibit the primitive state of civilization in those islands; but the dialects have diverged. The Philippine islands now offer the purest type of speech, since here may be found all the grammatical forms which appear more or less complete in the other groups. These islands, therefore, hold the same linguistic place, compared with sister groups, that we find exemplified by Tours in France, Valladolid in Spain, and Hanover in Germany. By some mysterious law of nature these sections have kept their speech nearer the standard, and may be fairly designated as the purest type of the common language.

Introduction of Spanish Words.—One of the most potent factors in the modification of language is commercial intercourse. Similarity has been noticed between certain Hawaiian words and those of identical meaning in Spanish. They furnish evidence of early contact between the two nationalities. Here are a few examples:

The words *mate* in Kanaka and *matar* in Spanish both mean *to kill; poko* in Kanaka means the same as *poco* in Spanish; *piko* means the same as *pico* in Spanish, as in *ka piko o ka mauna*.

Where do these native words come from? Does the following offer an explanation?

An old tradition relates that in the reign of Kealiiokaloa a foreign vessel was wrecked on the south shore of Hawaii. The only persons saved were the captain and his sister. They were kindly received by the natives, intermarried with them, and became the progenitors of well-known families of chiefs. Counting back through well-established genealogy and allowing thirty years to a generation, the wreck must have taken place between 1525 and 1530.

Three Spanish vessels left Mexico on October 31, 1527, bound for the Molucca islands, in the East Indies. Two of them were lost. No other white people were navigating the Pacific at that period, and it seems reasonably certain that the wrecked vessel was one of the three sent out by Cortez. Their westward course lay to the southward, and the violent *kona* storms of the Pacific would carry them toward Hawaii. On the return trip they went north to latitude 30°, to take the westerly winds, and thus passed far above the islands. This explains why Hawaii, although known to the Spaniards, was seldom visited by them. Old charts in the archives at Madrid show conclusively that the Hawaiian islands were known during the sixteenth century. This bit of history and tradition may possibly explain similar terms in Spanish and Kanaka, of which there are many. On the island of Hawaii may be found at the present day an apparently full-blooded Kanaka child, with pure South Sea features, yet possessing a white skin and a complexion similar to that sometimes seen in the Spanish-Moorish mixture. Will any one say that this may not be a recurrence and manifestation of certain influences in times past? Examples are not wanting in our own race where effects appear after having lain dormant for generations.

II.—PHONOLOGY.

Vowels and Consonants.—Let us now examine the language from the standpoint of

sound. The Kanaka ear is as delicate in detecting vowels as it is dull in the distinction of consonants. When Isaac Pitman invented phonography he used the straight line and parts of a circle to represent the English consonants. They were classified into labials, dentals, gutturals, liquids, etc., and the same signs, made heavy or light, were applied to different sounds of the same class. Now it happens that his classes are precisely those in which the Polynesian ear makes no distinction. For instance, with the labials *p* and *b*, we may say either *taburoa* or *kapuloa;* we may say *Honorourou* or *Honolulu.* As a matter of fact, the first form is invariably found in the earlier accounts of the islands. Ask a Kanaka which is right, *taburoa* or *kapuloa*, the reply will invariably be that his ear detects no difference. The term means *great taboo* and is used now as an injunction against trespass. This shows that the Hawaiians, in their inability to distinguish between *b* and *p*, *d* and *t*, *g* and *k*, *l* and *r*, and *v* and *w*, are following a natural law of human utterance, namely, that certain sounds similarly made readily coalesce, and without impairing the context may be used interchangeably. The fact also became evident when the problem of writing English phonographically was confronted. In phonographic characters, *p* and *b* have the same length and slope. They only differ in shading, a detail of minor importance, since the substitution of one sound for the other in the spoken word involves little uncertainty in the meaning.

Two invariable rules lie at the foundation of all Polynesian speech. Every word must end in a vowel, and no two consonants can be pronounced without at least one vowel intervening. Only one word has ever been printed in Hawaiian with two consonants together. That word is *Kristo* Christ. But any number of vowels may be pronounced consecutively, as in the word *hooiaioia* meaning certified, where we have eight continuous vowel sounds. Compare this with the English word 'strengths,' where we have nine letters and only one vowel. Before attempting the pronunciation of this word an Hawaiian would have to transform it by the introduction of at least eight vowels. No less would suffice to make it utterable by Polynesian organs of speech, and the probability is that many more would be interjected in the hopeless struggle to give birth to such an angular product of English speech. Take also the expression, *E i ae oe ia ia*, meaning *Speak thou to him there.* This is a complete sentence of six words in which not one consonant appears to mar euphonic beauty or to disturb the easy liquid flow of vowels so dear to the Hawaiian ear.

The importance of the vowels in the Polynesian languages is such that if we open a Hawaiian dictionary we find, not the order of letters given in English, but a totally different one. First come all words beginning with the vowels *a e i o u;* then those beginning with the consonants *h k l m n p w*. This completes the list of all pure Hawaiian sounds—twelve in number. Nine additional consonants, *b d f g r s t v z*, have been introduced from foreign tongues, because new words took root in the language. In passing, we may say that the Hawaiian consonants are probably the softest and most effeminate of the Oceanic group. In a dictionary of 502 pages, 111 were found devoted to the vowels, 387 to the native consonants, and 5 to the foreign ones, so that the words introduced are about one per cent. of the total number.

Cacophony.—There is a natural aversion in most languages to the consecutive repetition of the same sound, and especially so between words. An example is given on a following page, under 'syntax,' of affirmation by means of the article *he.* The phrase *he pono ole*, however, is never pronounced as

written, the *o* is elided, and we say *he pon ole*, just as the Spaniards in rapid speech use *boca bajo* instead of *boca abajo*. So strong is this sentiment that rules of gender are sometimes made to give way so that euphony may be preserved, and the method observed in Italian finds application in Hawaii. Instead of saying *na alii*, the chiefs, the Kanakas drop a letter and say *na' lii*. The Italians say *bel originale*, avoiding the repetition of *o*; the French use *mon amie* and the Spanish *el agua*, in order to eliminate the same disagreeable effect. In English the combination is equally distasteful and we say *an apple*; yet the Hawaiians do sometimes violate this rule in the middle of words. Notice the artifices employed in the different languages to avoid cacophony. The Kanakas prefer elision; the French and Spanish are willing to break another rule of speech in order to satisfy the ear, and couple words of opposite genders, while English avoids the difficulty by supplying a letter. The methods employed exemplify characteristic national traits. The Hawaiian accomplishes his purpose in any way that diminishes labor; he therefore cuts out rather than introduces. The energy of the Anglo-Saxon prompts him to interject something, and the Latins, true to their natural instinct, sacrifice symmetry of form to euphony of sound.

The Guttural Break.—Besides the Hawaiian sounds previously cited there is a guttural break which represents the elision of the *k* in other Polynesian dialects. It is indicated by a comma, just as the circumflex accent in French indicates the suppression of a letter or syllable in earlier forms. This break is an essential part of the word, and a disregard of it completely changes the meaning. For example, *ao* means light; *a'o* means to teach; *ia* means he; *i'a* means fish. There are many examples of this in the language.

As we pass from Sanskrit to Gothic, and on to high German, a regular mutation in the appearance of certain consonants is found. No less evident than this law of Grimm is the change of Polynesian sounds, and, although neither rule is infallible, both are useful in tracing certain paths of development.

The *l* in Samoan becomes *r* in New Zealand and returns to the original letter in Hawaii. The *p* in Samoan is *b* in Tongan, and is again *p* in Hawaii; *v* in Samoan is *w* in New Zealand, but remains *w* in Hawaii. The *k* in New Zealand is replaced by the guttural break in Tahiti and Hawaii. The vowels, however, undergo fewer changes than the consonants.

Meanings of aa.—The definition of words by context necessarily finds wide application in the stage of development now reached by the language of Hawaii. The sound indicated by the letter *a* is probably the most common in the entire range of articulation. Standing alone, it has, like many others, a variety of meanings; but doubled, it answers to nearly thirty significations, many of them of the most diverse nature. To begin with, *aa* may be either a verb, adjective, or noun, and some of its meanings are:

> *to burn, to tempt, to defy, to girdle, to make a noise, to send love.*

Then it may mean—

> *spiteful, silent, stony, mischievous.*

And finally it stands for—

> *fire, belt, dumbness, roots of trees, pocket, bag, dwarf, lava, covering for the eyes, bird of prey, caul of animals, sea breeze at Lahaina, husk of the cocoanut, chaff, outside of seeds or fruit, red fish.*

Add to these some adjectives that may be derived from verbal meanings and the number may be considerably increased. It is evident that a necessary condition for the successful employment of a word of such unlimited power is great flexibility of construction. The groundwork of the lan-

guage must be free from intricate forms of syntax.

Used alone *a* may be a noun, an adverb, a conjunction, a preposition, an interjection, a verb or an adjective. Under each part of speech it has several meanings. Here are a few when it is used as a noun: First, *the jawbone;* second, *an instrument made of smooth bone, used in piercing unborn infants;* third, *broken lava;* fourth, *white spots in poi;* fifth, *a sea bird;* sixth, *a small fish;* seventh, *the alphabet.*

III.—MORPHOLOGY.

General Characteristics.—We now proceed to develop the peculiar genius of the Polynesian languages, and of the Hawaiian in particular. They differ radically from the Indo-European family, which stands pre-eminent for the perfection of its organic structure, in three essential particulars:

1. They are completely devoid of inflections.

2. The vowel sounds largely predominate.

3. The construction has great flexibility.

Most writers on the subject fall into the naural habit of comparing the Oceanic with the European tongues, and analogies more or less real are indicated. These are often stretched beyond the limits warranted, perhaps with the laudable object of easing the student's path. The fact is the Oceanic family of languages is a distinct and separate creation, and must be followed on entirely different lines from those followed in Western speech. The inflections of our highly cultivated tongues add symmetry and elegance, but do not necessarily give flexibility. Even barbarous dialects can furnish in certain directions more varied locution for the conveyance of thought; for instance, in the Hawaiian language gender is denoted in two ways. There are five methods of distinguishing number. There are ten cases. There is almost endless variety in the arrangement of words, depending on the order of preference.

The Singular and Plural Distinctions.—The five ways of indicating number are:

1. By changing the article, as in most European languages, and saying *ka hale*, the house, or *na hale*, the houses.

2. By the use of the plural sign *mau*, which can be associated with any noun. Thus they have *he mau lio*, several horses; or,

3. One may employ a collective noun; as in

he poe haumana, a company of disciples;
keia pae moku, these islands;
he pu'u pohaku, a pile of stones;

Poe is applied to living things, *pae* to lands and islands, and *pu'u* to lifeless objects. These shades of meaning, invariably observed, impart a vividness to the language unknown to Western speech.

4. The plural may also be indicated by shifting the accent; as, *kanáka*, a man; *kánaka*, men. And, finally

5. The same idea may be expressed by using the work *ma*, which means literally a company.

Here then are five distinct ways of expressing an idea for which only two exist in our own language.

Tense and Case.—The distinctions of time are never so definite as in other languages, the chief attention being centered on the accidents of place. The word *ana* denotes continuance, and may be past, present, or future. Thus *e hana ana au* may mean, I *am* working, I *was* working, or I *will be* working, according to the connection.

Take the relations of case. There are ten. The six cases of Latin are well defined, and four of them—the genitive, accusative, vocative, and ablative—each have two shades of meaning, for which only one means of expression exist in English. Not only this, but one of the subgenitives, the *aui pili*, has two significations for which we

have only one. This difference is so distinct in the Hawaiian's mind that the distinguishing words are seldom, if ever, used interchangeably. In designating the cases, recourse is necessarily had to Hawaiian terms, since no European tongue provides sufficient names. The extreme development of the case relation is seen by comparison. The English has 4; the Latin, 6; the Sanskrit, 8, and the Polynesian, 10.

The formation of words is one of the interesting phases of the language. As in all uncultivated tongues, intensity of expression is accomplished by repetition. This may be done by doubling a letter, a syllable, or even two syllables, as

a means to burn, *aa* to burn hotly;
naki means to bind, *nakiki* to bind tightly;
pulu means wet, *pulupulu* very wet.

A noted distinction before referred to in speaking of case is made between active and passive relations, as indicated by the prepositions *a* and *o*. If we refer to the house a man built, we use *a*; if he simply lives in it, we use *o*—*e. g.*:

ka hale a Keawe means the house that Keawe built;
ka hale o Keawe means the house that Keawe lives in.

a is employed in speaking of a man's wife; *o* in speaking of his maid servant—*e. g.*:

ka wahine a Keawe means Keawe's wife;
ka wahine o Keawe means Keawe's maid servant.

The literal translation is the *woman of Keawe*, but whether she bears the relation of wife or servant is indicated by the choice of prepositions. By the mere change of one sound in the sentence a husband may imply volumes of meaning.

A refers to an oven for you to cook with; *o* to an oven for you to be cooked in. In New Zealand they say—

he hangi mau; to cook with; but
he hangi mou; to be cooked in.

This introduction of a particle to completely change the meaning is common in some of the Romance languages. Take the example in Spanish:

Mi hermano quiere una criada; and—
Mi hermano quiere á una criada.

The first means that my brother wants a maid servant; the second, that he loves one.

Forms Similar to the French.—A striking similarity to the French exists where the noun is inserted between the two parts of the pronoun—*e. g.*:

ua moku nei = ce navire-ci = this ship;
ua mokú la = ce navire-là = that ship;

ua-nei being here a strong demonstrative.

Note also the resemblance between

keia and *kela*—meaning this and that—and *ceci* and *cela*.

The idea of *everything* would be expressed in Kanaka by that thing, this thing, *kela mea keia mea*.

In this phrase we see again the lack of generalizing power of the Polynesians.

The Hawaiian is one type of the agglutinated languages. The combination of the article with a proper name forms a new compound, in which, however, the original signification of the article is lost. The names of two of Hawaii's famous queens may be cited as examples.

Kapiolani means the heavenly prisoner; *Liliuokalani* is the lily of heaven.

IV.—SYNTAX.

Relative Pronouns.—When we come to compare the Polynesian languages with the Indo-European from the point of view of syntax, many interesting peculiarities are developed. The fact that all their mental action follows special lines involves a radical modification of our methods of expression. Some of our constructions apparently necessary and certainly logical cannot be employed.

No relative pronoun has ever been found in Hawaiian. This does not involve a lack of logical clearness. From their mode of

thinking they find little use for relatives; but the meaning is just as unequivocal as though the sentence were constructed after a Latin model.

For example,

O ka'u poe ke iki ka poe nana ka laau,

means literally,

My children are those for them the timber;

or, freely translated:

My children are those *who will own* the timber.

Absence of Verbs.—In this last sentence we see several peculiarities. In the first place, *o* is used simply for euphony. It cannot be translated into English. Then the word *poe* has no equivalent. In the next place, there is no verb. Some of the strongest and clearest affirmations are made in Hawaiian without any kind of a verb; there is no verb in the language to express the idea of existence. The structure of the idiom does not require it. Neither is there any verb to express having or possessing, nor to express duty or obligation, nor to affirm any quality as belonging to any substance; but these ideas are necessary in the communication of thought. How, then, do the Hawaiians express them? In various ways:

I. By particles of affirmation, as: *he akamai kona*, a skill his—*i. e.*, he has skill. A construction similar to this is found in Hebrew and other Semitic languages.

II. By *he*, a simple article, as: *he pono ole*, a good not—*i. e.*, good does not exist therein. In other words, it is unrighteous.

III. Affirmation is sometimes expressed by the pronouns *ia*, *eia*, *keia*, etc., as:

O ia ka poe i hele mai (the *o* is emphatic).
(Those were) the people who came.

In fact, verbs play a very subordinate part in the language and are seldom employed, since their place is supplied, as occasion arises, by other parts of speech. Take the sentence that appears on the Hawaiian coins:

ua mau ke ea o ka aina i ka pono; meaning

(is continued) the life of the land by righteousness. The affirmation seems to be made in the first word, *ua*, although this is sometimes a supernumerary word, or at least an auxiliary one.

Position of Nouns.—A peculiarity about nouns is that they may stand in almost any part of the sentence except at the beginning. The whole method of affirmation is unique. It may be done by several parts of speech. Here is an example where a noun contains the idea:

I ka po ka lakou hana; meaning
In the night was their work.

In the following case there is no verb in the sentence, and the pronoun contains the declaration within itself:

(*Oia*) *ka mea i loaa i ka waiwai;* meaning
(That is) the thing to obtain wealth.

Some phrases are difficult to understand. This was once found in good Hawaiian:

O makou hoi, o na elemakule kane, a me na elemakule wahine;

which literally means:

We, also, the old men males and the old men females.

Just what is implied therein has baffled more than one Hawaiian scholar. The idea may be akin to that contained in the Spanish phrase *Voy á dar un abrazo á mis padres*, where the word *padres* is employed when both father and mother are meant, the meaning, of course, being that he is going to embrace both of them.

French and German Constructions.—In certain constructions two negatives are necessary just as they are in French. *Nele* means to lack, and *ole* means not; yet they are both employed, and, taken together, have the force of one negative only, as:

Nele na Kanaka o Honolulu i ke kumu ole.

This *ole* in our idiom would be superfluous but the Hawaiian requires it. The French

ne-pas is precisely parallel, and the French equivalent of the Hawaiian phrase is:

Les gens de Honolulu n'ont pas d'instituteur.

The interjection of words between two parts of a verb as in the German is very common, as:

Na lawe malu ia ke dala.

The other form would be with *laweia* as one word; and the phrase translated into German, using a separable verb to show the correspondence, would be:

Man nahm das Geld heimlich weg.

Here is a case where the regular German separable verb construction is duplicated in Hawaiian.

Flexibility.—The Polynesians avoid inflection. But if their language is loose and cumbersome in this respect there are corresponding advantages. Indeed, from this very fact great flexibility becomes a necessity, and any sentence may be cast in a variety of ways, depending on the idea which is to take precedence or acquire emphasis. Take the phrase, 'I give this to you.' Here we have five words. The sentence may have as many different arrangements in Hawaiian, according to the shade of meaning sought. When it is desired to bring out the fact that an object is given and not loaned, the words *ke haawi* take precedence, as:

Ke haawi aku nei au i keia ia oe.

When prominence is given to the idea that it is I and not some one else who gives, the form is:

Owau ke haawi aku nei i keia ia oe

and so on through the five different arrangements, each laying stress on a different idea and all perfect models of pure Hawaiian syntax. It cannot be denied that this flexibility gives to the language a power and subtlety unknown in the inflected tongues.

We are all familiar with that inimitable scene in the *Bourgeois Gentilhomme*, of Molière, where a lover repeats in five different ways: "Fair Marquise, your beautiful eyes make me die of love." The actor succeeds in revealing an ardent passion, but his French is intolerable. An untutored Kanaka from the South seas would have been able to bring out in his native speech all these shades of meaning, impossible in the cultured language of France. But the French language, proud mistress that she is, will not tolerate these liberties of construction that the Polynesian tongues not only permit but even court. The higher the civilization, the more acute are the forms of thought. The more exacting the rules of syntax become, the more limited appears the capacity for flexibility.

It is a peculiar trait of the language that the same word may be used as a verb, noun, adjective, or adverb. As an example, let us take the common word *aloha*, and we have

As a verb: *ke aloha aku nei au i kuu hoalauna*—

I love my friend.

As a noun: *he aloha kona i kona hoalauna*—

he had love for his friend.

As an adjective: *he alii aloha no ia i kona hoalauna*—

he is indeed a loving chief to his friend.

As an adverb: *hana aloha ae la kela ia ia*—

that person treated him with friendship (love).

Even the pronoun I can be used as a verb. A native, relating his reply to the question as to who possessed a hat, said:

Owau aku la no hoi au owau,

which translated literally is:

I 'ied' to him, I

that is,

I said to him I had.

But then our language is sometimes given similar license. A schoolmaster once asked for an example of an interrogative pronoun used as a verb. No one was able to reply

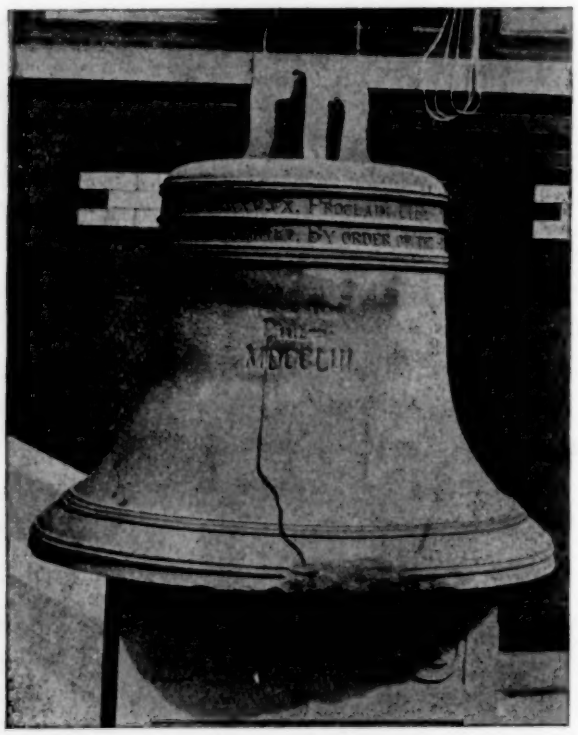
successfully except a mischievous urchin who had been thrashed for saying *what*, and his answer was, 'Give me that stick and I'll *what* you.'

Erasmus Darwin Preston.

(*To be continued.*)

SANDSTONE DISINTEGRATION THROUGH THE FORMATION OF INTERSTITIAL GYPSUM.

A block of Carboniferous sandstone from New Brunswick, carved in the form, and in imitation, of the Old Liberty Bell, was some years ago, owing to the crowded condition of the Exhibition Halls of the National Museum in Washington, removed to a point near the northwest entrance, outside of the building.



When placed in position the stone was fresh, and surface smooth throughout. Within the space of a couple of years there appeared on the northwest side a slight roughening of the surface and a whitish efflorescence which during the two ensuing years extended gradually two-thirds around the northern and southern sides, but was always most marked on the northwest. On examination the efflorescence was found to be due to the formation of small gypsum crystals, and the roughening of the surface to the falling away of the siliceous granules. The process has gone on until now more than an eighth of an inch in thickness of material has been removed from the point of surface first attacked, and the inscription in part obliterated, as shown in the accompanying illustration. It is to be noted that the zone of disintegration is limited wholly to that portion of the bell just above the middle, where the surfaces stand nearly vertical, while elsewhere the material is almost as fresh and unaltered as when first exposed.

An examination of the stone shows it to contain numerous small segregations of marcasite which are quite inconspicuous, or show up as small dark spots on the weathered surface. Chips of the fresh rock effervesce slightly in dilute acid, indicating the presence of calcite. The disintegration is doubtless due, therefore to the oxidation of the marcasite through the downward percolation of rain water, and the reaction of the sulphuric acid formed upon the calcium carbonate. The resultant calcium sulphate is then brought to near the surface by capillarity where it crystallizes, and, as growth takes place always from the base of the crystals the sand granules are gradually forced off in the manner so often exemplified in the lifting of soil through the formation of hoar frost. The writer has described (Proc. U. S. Nat. Mus., Vol. XVII., 1894, p. 80) the splitting of blocks of limestone through similar gypsum growths, as noted in the dry portions of Wyandotte and Mammoth Caves, but has never seen the phenomenon so well illustrated in sandstone as here. In as much as it offers an explanation for the disintegration of sandstone of this type where exposed in the walls of buildings, the case is worthy of mention.

The gypsum efflorescences, it should be

noted, have the plumose and curved forms occurring in the rosettes of the caverns mentioned.

GEORGE P. MERRILL.

THE NATURE OF THE SMILE AND LAUGH.

A DEFINITION of the smile and laugh is not needed by any one, for to every human being it is a self-evident birth-right, an axiomatic fact. Nor in general does this phenomenon (we shall consider in this essay the smile as only a lesser degree of the laugh) need description, and for the same reason. But the nature of the smile and laugh psychophysiologically does need explanation, why it is as it is and not otherwise. We shall try then here to look a little at the biological character of this incident of our common experience.

Herbert Spencer in his famous essay on 'The Physiology of Laughter' (1860), suggests as the occasions of the laugh, these: The ludicrous, joy, sardonic stimuli, hysterical states, mental distress, tickling, cold, and some acute pains. It seems, however, that pure or typical smiling and laughter comes from what is best termed joy, alone. It is only by inaccuracy of observation and a deficient consideration of certain facts that that smile-like expression of the face occasioned by 'sardonic stimuli,' mental distress, and acute pains is termed a smile, for while it is obvious, indeed, that the facial 'expression' of this tone of feeling is somewhat like that of unalloyed pleasantness, yet there are differences. These differences are chiefly in the mouth in the way of a greater uncovering of the upper teeth, with a different look about the eyes, the total appearance being harsher, in a way hard to particularize but very easy to feel. The so-called laughter of really painful states, at best only rarely observed, seems to depend on the well-established affective principle that the extremes of contraries tend to produce like effects, probably through the occurrence of wide radiation in the cortex, as would be expected when the stimulus is on the verge of abnormality of strength. Again, it must be remembered that so perfect and sensitive is the neuromuscular mechanism in question that even in an experience which is chiefly unpleasant or painful, even a momentary idea of any sort, or a brief cessation of the pain (in itself a pleasantness), would serve as the occasion of a true smile and so complicate the expression, giving it more the look of a properly occasioned smile. Tickling, on the other hand, is essentially pleasant if not too long continued; and it is characteristic of hysteria in a marked degree that it simulates arbitrarily every known emotion to perfection, or rather is in itself a versatile emotional state. It seems proper then to consider the laugh and smile as concomitant properly only to pleasantness or to pleasure, whether this affective tone be derived from purely conceptual relations, as in humor, or from stimulation of whatever bodily organs are in their action concomitant to pleasure.

One may observe even within the first week of the post-natal life of the infant that the eyes and especially the mouth display at times an incipient smile, the purely reflex or mechanical accompaniment of a true sensational pleasantness, arising usually from the normal functioning of the digestive process. A very few weeks later (two, as I have observed in one infant), the consciousness has become so far familiar, so to say, with its organism, as to bring out nearly if not quite in all its adult details the action of the inborn intricate mechanism of nerve and muscle. The 'hearty laugh' does not seem to occur until a somewhat later period, aloud and briefly perhaps by the end of the eighth week, but as a general bodily process not before two or three years of life have passed; this is not, probably, because of any incompleteness in the ap-

paratus of laughing, but because humor, which is the commonest occasion of this extreme manifestation, is not appreciated earlier. It seems probable that the shock produced by the sudden understanding of the 'point' of a joke has much to do with the intensity of the reaction in this case.

The practical perfection of the smile and laugh (as of the expression of grief and pain) at this very early period of life is a fact in itself worthy of note, and serves to emphasize both the universality of laughter in man and its deep-founding in the organism. When a few weeks old, or when even a few months old commonly, the average infant has not voluntary control enough over even its most mobile members, the finger and thumb, as to extend the latter into its mouth, even when the child searches his hand with his mouth with great eagerness for some much desired projection, and that even when it has been so extended for him repeatedly. The contrast of such helplessness with the innate perfection of the smile, involving the simultaneous action of a dozen or more muscles on each side of the face, is a striking illustration of innate reflex function, and little less remarkable than the mechanical actions of sucking and digestion themselves. It seems indeed proper to suppose that the nervous mechanism for the 'control' of so complex a set of movements should be related to the deepest and most basal opposition in which the muscles are concerned, namely the functions of extension and of flexion, of increasing and of decreasing respectively the general superficies of the body. Imitation has clearly little or nothing to do with the original process of the smile, for many weeks after the child can smile to perfection, he is totally unable to imitate even the bending of a finger although the simple act be performed a hundred times before his eyes. It must surely be judged that the smile is wholly instinctive and in a sense reflex, a psychophysical characteristic of at least the human young by the inherited law and structure of its being.

The biologic purpose and value of the smile and laugh are not far to seek, not much further indeed than are those of the expression of grief and pain as the appeals of the crying needs of the child to his mother: both of these are obviously biologically protective and preservative. A glance at the usefulness of the smile will show what in part has made it so invariably an aspect of the psychophysical life of man, and, doubtless by imitation, perhaps of some of the highest brutes. In the infant the smile very early becomes the index of the parental attitude toward him, and hence, because of its great biologic interest for his personality, he is apt instinctively to become at a surprisingly early period fairly learned in the physiognomy of the smiling, as of the frowning, face. Again, when the time has come in the course of nature that the young man acquires a highly specialized interest in one of the opposite sex, the smile becomes to a quite characteristic degree the object both of admiration and of further study. Later on, in business life, the smile, as exponent of the emotional attitude of those with whom the struggle for existence puts the man into some sort or other of competition, becomes even commercially important, and when an individual has profited so well by his long subconscious study of smile physiognomy that he can in general distinguish the natural or true smile from that of him who can smile and smile and be a villain still, his education in this direction may be called complete. It is because the smile is normally the indication of a pleased friendliness that it plays so important a part in the serious affairs of social intercourse, as useful as such to the schemer and the rogue as to the one enjoying properly the pleasurable society of his friends.

In his classic treatise on emotional expression Darwin gives the results of his numerous inquiries of persons in all parts of the earth as to laughter among savage races, and these were invariably to the effect that the phenomena is identical among them all: the seemingly wretched dweller in Terra del Fuego or the pigmy in the dark forest of the heart of Africa smiles precisely as does the newly made peer of Britain when he is alone, and for a precisely similar reason—because he is at that moment unusually happy. The cannibal may laugh at the contortions of his victim roasting in the fire before him, and the pampered infant in his nurse's arms may be wreathed in smiles at the prospect of another sugared 'cookie,' but the process in the two cases is not different and the physiologic cause is the same—pleasure, or the prospect of pleasure in itself pleasant. Dogs and monkeys are not infrequently seen to smile, and there are many who consider certain joyous manifestations in other animals as properly laughter. The nearly continuous state of smiling or laughter often seen in the case of imbeciles may obviously be taken as the reflex organic co-ordinate of that constant tone of pleasantness which these persons doubtless usually experience. The limitation of intelligence in these subjects makes it impossible for them to realize the serious burdens of life, while the somatic process, to an awareness of which their consciousness is often reduced, certainly gives as its psychic tone a complex sense of pleasantness or even of pleasure. It is on this account that in very young children, savages, and imbeciles the smile is to be observed at its purest, physiologically speaking.

Aside from innumerable references and descriptions, throughout general literature, of the phenomena we are discussing, the technical treatises on their physiology have been relatively numerous in all ages, although many of the books which pretend to explain laughter are really treatises on wit or on humor or on both, and contain little or nothing physiological, while the riddle why humor causes laughter and what the former is withal, is still as far as ever, apparently, from its interesting solution. It is sufficient for us that we ignore wit and humor, and begin with the *pleasantness* which these, together with innumerable other causes, produce in the soul. With this we may start with entire confidence, for, save perhaps in rare abnormal cases, the smile and laugh are everywhere the natural 'expression,' or, better, correlates, of pleasantness or joy in the individual. What, then, are the bodily accompaniments of general pleasantness in the human animal? The more conspicuous of the reactions may be suggested as follows, which later on we shall endeavor to explain and to account for.

There occur in laughter and more or less in smiling, clonic spasms of the diaphragm in number ordinarily about eighteen perhaps, and contraction of most of the muscles of the face. The upper side of the mouth and its corners are drawn upward. The upper eyelid is elevated, as are also, to some extent, the brows, the skin over the glabella, and the upper lip, while the skin at the outer canthi of the eyes is characteristically puckered. The nostrils are moderately dilated and drawn upward, the tongue slightly extended, and the cheeks distended and drawn somewhat upward; in persons with the pinnal muscles largely developed, the pinnae tend to incline forwards. The lower jaw vibrates or is somewhat withdrawn (doubtless to afford all possible air to the distending lungs), and the head, in extreme laughter, is thrown backward; the trunk is straightened even to the beginning of bending backward, until (and this usually happens soon), fatigue-pain in the diaphragm and accessory abdominal muscles causes a marked proper flexion of the trunk for its relief. The

whole arterial vascular system is dilated, with consequent blushing from the effect on the dermal capillaries of the face and neck, and at times of the scalp and hands. From this same cause in the main the eyes often slightly bulge forwards and the lachrymal gland becomes active, ordinarily to a degree only to cause a 'brightening' of the eyes, but often to such an extent that the tears overflow entirely their proper channels. The whole glandular system of the body seems to be likewise regularly stimulated (pleasantness being sthenic to the organism), causing the secretions, gastric, salivary, sudoral, mammary, genital, to be augmented, with a consequent rise of body-temperature and a general expansion of cellular activity. Volubility is almost regularly increased, and is indeed one of the most sensitive and constant of the psychophysical signs of moderate delight, although often quite inhibited in the excessive degrees of joy.

In the true scientific spirit, without thought doubtless of desecrating the fame of 'the human face divine,' the most beautiful of things, Angelo Mosso calls the face 'a muscular funnel at the end of the alimentary canal,' and in an interesting way he accounts for the complexity of its muscular portions by the obvious needs of seizing, masticating, seeing, etc. Moreover he points out four reasons why the facial muscles are so mobile, and these are as follows: first, because of their small size; secondly, because of their continual usage; thirdly, because of the close connection of their motor nerve, the Seventh or Facial, with the deep-lying cerebral centers; and lastly, because, as he thinks, there is no mechanical opposition between them. Accepting the first three of these as undoubtedly valid, with the last it seems from considerations soon to be suggested necessary to disagree, because it is probably erroneous. It is going back even to Aristotle to maintain that function is more fundamental than structure, and a reminder of the affective opposition which obtains in the face in the conditions on the one hand of joy and on the other of grief is all that is required. In the one case the features may be considered as drawn upward and in the other as drawn down. But in structure as well as in affective functioning, the opposition between these small and numerous bundles of muscular fibres may be clearly demonstrated if only the research be conducted at the proper period of development, the fœtal, and if only the neural paths and centers by which these muscles are directed be considered as part of their mechanism, as is philosophically necessary. From no point of view other than this is there structural opposition between any of the muscles, for histologically all, throughout the body, are similar (save as regard differences which are here beside the point). It is in fine a portion of our present thesis that the muscles of the face are extensor or flexor as are the other muscles, for the most part, of the body—an opposition at once functional and morphologic.

Now continuing to confine ourselves mainly to the facial manifestations of the bodily side of laughter (for it is here that the greatest general interest lies), let us see what are the broad general principles or biologic tendencies which underlie and make the smile and laugh what in fact it is.

In a monograph named 'The Emotion of Joy' (Macmillans, April, 1899), the writer summarized the results from nearly three years of research in the psychological laboratories of Harvard and Columbia Universities into the bodily processes which respectively correspond to pleasant and to unpleasant periods of consciousness. Some thousands of experiments made during that time on normal subjects (mostly students and professors of philosophy), demonstrated among other things that even in animals

so far from biological näiveté as these, there exists a psychophysical principle which can be concisely stated as follows: *In general, states of pleasant consciousness are correlated in the body by contraction of muscles classed as extensor, and, conversely, states of unpleasantness with contraction of flexor muscles.* This is an ancient and more or less popular hypothesis, but usually in a form where bodily expansion and contraction are suggested rather than muscular extension and flexion respectively, a tendency indeed which is to be observed in very many animals from the amœba, the type, upward in morphologic complexity. This expansion-flexion tendency, so to call it for convenience, being then an inherent opposition in the neuro-muscular structure of animal organism in general, its relations to the hitherto mysterious phenomena of the smile are of a certain general interest. Now it appears, in short, that *the smile and laugh are in fact fully explained by this general biologic principle*, as will become clear from the following considerations:

Even as the affective principles are manifested as early as animal life itself, so must one search very early in the morphologic changes of the individual, very likely indeed in the early stages of the embryo, for the forms which normally determine adult affective structure and function. Function is properly more primary than form, and one generation determines by its habits to some extent invariably the structure of the next; we should look, then, to the early embryo for the direct correlation of the functions which are to obtain in the adult life. At any rate, in the fœtus we find conditions, more plainly marked than in later states, which make adult functional relations clear. Although the 'primitive streak' is at first necessarily straight, folding begins very early, and at the end of the first month, in the human fœtus, the embryo is bent upon itself to a very marked degree. The curve which forms in the region afterwards the lower cervical is for our purpose the most significant, although the growth forward of the anterior lobes helps in the case of man to make this antero-posterior bending more marked and physiologically more significant. This curvature remains quite patent in the adult in all the canals which extend from before backwards in the head: First, in the ventricles of the brain from the third to the 'sixth' down the spinal cord. Second, from the nostrils upward and backward and then downward into the trachea. Third, from the mouth similarly upward and backward and downward into the œsophagus. All these in a proper philosophic sense outline even in the adult forms the curve which, at the period of individual development when the functions of the muscular system were being firmly established in the formative plan of the organism, is even more plainly apparent. In the strongly prognathous type of structure these conditions are all emphasized, as they are in animals with long probosces which these muscles in part serve to extend. It is at this very early formative period that the neuro-muscular system is beginning to take on its basal opposition of flexion and extension, the large muscle of the scalp, the Occipito frontalis, being the strikingly complete type of this far-reaching functional division, for the frontal half draws directly backward in a way to tend to extend the face and the head.

On this same dual principle do all the facial muscles act, as may be seen from a brief technical rehearsal of the most important of them and their functions. The Risorius, the 'laughing muscle,' draws upward and backward the corners of the mouth; the Zygomatici have a similar action on the lower jaw; the Levator labii superioris, as its name perhaps sufficiently implies, lifts the upper lip, as does the Levator labii superioris et alæque nasi, and in addi-

tion the outer and lower walls of the nostrils; the Levator menti lifts the soft parts of the chin; the upper portion of the Orbicularis palpebrarum raises the skin about the eyes, and the Pyramidalis that over the root of the nose; the Dilatores nasi lift and expand the lower portions of the nose; the Rectus oculi superior rotates upward the ball of the eye; and the Corrugator supercillii raises the inner ends of the eyebrows until the latter are straight. Thus all these, physiologically speaking, tend when they contract to straighten the curve which, morphologically, extends from the upper portion of the vertebral column upwards, forwards, and then somewhat downwards to the chin, and hence by this fact they tend to complete what is biologically the extension of the body.

It is thus seen that those muscles of the face which take part in or actually produce the facial portion of the 'expression' of joyful emotion, those in other words which by their movement constitute the smile and laugh, are extensor in the same sense as are those of the hand, neck, forearm, leg, and trunk, whose contraction has been previously demonstrated (see research referred to above) to be correlate with the pleasantness of the individual's experience at the time, although it is evident that the general form of the face and its complex functions make this myologic division of function less obvious than in case of the muscles of the rest of the body. The smile is then nothing exceptional, and is no more mysterious than is this general duality of action which obtains in every portion, apparently, of the muscular and neural mechanism.

Study of unpleasant affective states negatively corroborates, as we have already suggested, this explanation of the nature of the smile and facial laugh by exhibiting quite the opposite muscular reactions, as the term 'long face' so well implies in common speech. In disagreeable periods of experience the head, furthermore, is apt to be bowed, the eyes downcast, the eyelids lowered, and the corners of the mouth and the skin of the forehead drawn down. This opposition was the basis doubtless of the 'principle of antithesis' announced by Darwin the second of his principles of expression, and which has met with so great resistance from many modern physiognomists; it now appears in a new and a much stronger light as indeed a deep-lying tendency in living organisms.

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*REPORT ON THE WORK OF THE MORRILL GEOLOGICAL EXPEDITIONS OF THE UNIVERSITY OF NEBRASKA.**

Through the generosity of the Hon. Charles H. Morrill, of Lincoln, the expeditions sent out from the University of Nebraska, known as the Morrill Geological Expeditions, have become a permanent organization of the University. Therefore, it is but a fitting mark of respect that reports of these expeditions be given to the Nebraska Academy of Science from time to time in order that they may become matters of record. Introductory to this work, a private geological excursion was undertaken in June of 1891, by Mr. Erwin Hinckley Barbour in the interest of the University of Nebraska. At this time the Dæmonelix beds of our State were discovered and explored, and the Bad Lands of Nebraska and regions in South Dakota were visited, the result being that a very considerable collection was made and several new genera and species found. In May of 1892 a second trip (likewise at private expense) was made to the Sioux county Bad Lands and to the Dæmonelix beds. Again a large amount of material was secured and added to the collections of the State Museum. At this

*Paper read before the Nebraska Academy of Science.

juncture the Hon. Charles H. Morrill, of Lincoln, came forward with liberal contributions for the prosecution and continuance of the work. Then followed during June, July and August of the same year the first of what has become the annual Morrill Geological Expeditions.

A well equipped party of six (exclusive of guide) namely: T. H. Marsland, F. C. Kenyon, A. C. Morrill, H. H. Everett, J. H. Haines and Erwin H. Barbour in charge, visited the Bad Lands of the State, and especially the Dæmonelix beds, continuing thence into South Dakota and to the Dinosaur beds of Wyoming.

In 1893 a similar sum given by Mr. Morrill made possible the second annual Morrill Geological Expedition which visited and collected in the Rhinoceros beds of Kansas, the Hat Creek Bad Lands and the fossil Corkscrew beds in the Loup Fork Tertiary of Sioux county. The party consisted of T. H. Marsland, H. H. Everett, with Erwin H. Barbour in charge. Later the director of the expedition extended the work of collecting to the Middle and New England States.

The third annual Morrill Geological Expedition, 1894, consisting of U. G. Cornell, H. H. Everett, A. C. Morrill, E. L. Morrill, J. P. Rowe, Samuel McCormick, guide, Erwin H. Barbour, as director, drove from Hot Springs to the Big Bad Lands of South Dakota where some six or eight weeks were spent, thence to the Black Hills and beyond into Wyoming and Montana. The result of the expedition being that an unusually large amount of material of great variety including fossils, minerals, rocks, etc., was secured.

In 1895 the fourth annual Morrill Geological Expedition consisting of U. G. Cornell, H. H. Everett, F. G. Hall, G. H. Hall, E. F. King, J. P. Rowe, G. R. Wieland, T. H. Marsland, Francis Roush, guide, Erwin H. Barbour in charge, continued work from the Dæmonelix beds and the Little Bad Lands of Nebraska to the Big Bad Lands of South Dakota thence to the Black Hills and beyond. This was the largest and best equipped party sent out as yet.

In 1896 the fifth annual Morrill Geological Expedition extended its work to eastern fields, spending some time in the Carboniferous of Nebraska, a week in the Devonian of New York, and a couple of weeks in the Silurian of Ohio and Indiana.

In the summer of 1897 the sixth annual Morrill Geological Expedition consisting of B. G. Almy, U. G. Cornell, O. A. Reitz, Francis Roush, guide, Carrie A. Barbour, E. H. Barbour in charge, again visited and collected in the Big Bad Lands of South Dakota, the Black Hills region, the Little Bad Lands, the Dæmonelix bed of Nebraska and beyond into Wyoming.

In 1898, the seventh expedition was influenced by the Trans-Mississippi Exposition in Omaha, and the museum force and assistants in the geological department became interested in the preparation of exhibits illustrating our natural resources. The quarries of the State, more particularly those of southeastern Nebraska, were visited and important economic sets of building stones, clays, soils, etc., were added to the Morrill collections.

The eighth expedition, 1899, was divided into five distinct parties, two of which were provided with teams and camp accoutrements, the other parties going by rail from place to place. A party of two followed the Dakota cretaceous from Oklahoma to South Dakota. Another drove through the quarry regions in southeastern Nebraska. A third party, a graduate student in the department of geology, spent the summer collecting Bryozoa in the Carboniferous.

The writer with assistants, spent some weeks collecting invertebrate fossils in the carboniferous exposures, while the director,

with an assistant, visited fields in Wyoming, Montana, Dakota, and Nebraska. Over two hundred boxes of excellent material were added to the collections of the State Museum.

A geological expedition for 1900 is already assured by a recent gift, to that end, made by Mr. Morrill to the Board of Regents of the University of Nebraska.

In each instance the Burlington & Missouri River Railroad furnished free transportation for the party and 'outfit' as well as for all material collected. So with free transportation, and the gratuitous service of students of the University of Nebraska and with all expenses defrayed by the Hon. Charles H. Morrill, a maximum amount of material at a minimum cost was massed together. Sets of duplicate specimens have since been donated to 40 accredited high schools, academies, and colleges in the State, and exchanges have been made with the following universities: Ohio, Utah, Kansas, Minnesota, Columbia, Case School of Applied Science and to the Field Columbian Museum, and the National Museum. These collections seem to have unusual exchange value, the demand for them even exceeding the supply. The usefulness then of Mr. Morrill's work has extended beyond the limits of the State, and while contributing to the cabinets of others, his own collections have been so enriched as to fill most of the cases on the main floor of the State Museum and some of the cases on the second floor.

Carrie Adeline Barbour.
The University of Nebraska.

SCIENTIFIC BOOKS.

The Cyclopedia of American Horticulture. By L. H. Bailey and Wilhelm Miller. Comprising suggestions for cultivation of horticultural plants, descriptions of the species of fruits, vegetables, flowers and ornamental plants sold in the United States and Canada, together with geographical and biographical sketches. In four volumes. Illustrated with over two thousand original engravings. New York, The Macmillan Company. Vol. I., A. to D., pp. xxii + 509, figs. 743.

In these days of the rapid multiplication of books no small responsibility attaches to their reviewers. Indeed the reviewer may assume a greater responsibility than either the author or publisher, for to him prospective purchasers and readers turn in the confident expectation that he will so advise them that they shall waste neither their money nor time. In the world of letters, to be sure, it may be an actual merit in a book that a hot summer's day, a monotonous railroad journey, or a number of restless hours at bedtime can be sunken in its perusal. But outside the pastime series, the information conveyed is expected to be accurate and proportionate in quantity and value to the time consumed in getting at it. And it is precisely for advice on this point that the public turn to the columns given over to the reviewer; for the author, as a rule, modestly refrains from sounding the praises of his ware, and the publisher quite as commonly advertises a book for what it ought to be as for what it really is.

One of the first questions that the reviewer faces nowadays, he most frequently leaves unanswered on paper, however he may answer it in his own mind, namely, why the book has ever seen the light. For himself, since the thoughtful publisher has sent him a copy with the compliments of the house and the card of the author, he does not need to decide whether it is worth the cost of purchase, and so he passes by the line of least resistance to the independent discussion of its merits and demerits.

This question of the need for its publication is more readily answered for the 'Cyclopedia of American Horticulture,' than for most books, since it is easier to answer it on the merits of a book alone when the book belongs to a class that does not comprise many titles, than when hundreds of books of about the same scope have been brought out. There are few comprehensive books on Horticulture, and none on American Horticulture which cover the ground mapped out for the new Cyclopedia. A generation or two ago the books of Loudon

and Lindley told, more or less in a nutshell, what was known of economic plants, and the exquisitively conceived little Treasury of Botany of Lindley and Moore has made more intelligent gardeners than perhaps any other one book. Still, when Mr. Nicholson of Kew undertook the compilation of a Dictionary of Gardening nearly a quarter of a century ago, none of these works were sufficiently recent or full to prevent his book from appealing to the horticultural public, for whom it has done very much. But a quarter of a century is a long time as viewed by the gardener whose business shifts from carnations to roses, from roses to chrysanthemums, and from chrysanthemums to cactus-dahlias, and whose need to meet closer competition is often tided over by the introduction of simpler or cheaper methods applied to vast quantities of one thing that must be marketed by thousands before the infinitesimal profits have counted up to the point where they require banking, though beyond this point they may aggregate a very handsome revenue each year if only the business done is large enough; and this has led to the publication, within recent years, of excellent floricultural books, by Henderson, Scott, Hunt, and a host of other men whose business success stands as an endorsement of their teachings.

But these books are limited in their object, and although Nicholson's Dictionary has been able to grow somewhat in the course of a long-drawn-out rendition into other languages than the English, it does not even then give all the information needed to-day about decorative plants; and the newer methods by which success has so largely been achieved in this country, are not to be learned from it. Professor Bailey's book, therefore, aiming at the presentation of the plants and methods of American horticulture to-day, meets a real need in the library and the potting-shed, and it would be just as useful if the year of its appearance did not end in two ciphers, though its historic reference value may possibly be enhanced by the catching circumstance that it presents these facts as they exist at the end of the nineteenth century.

If the entire authorship of such a work had fallen upon one man, Professor Bailey possesses a sufficiently broad knowledge of botany and horticulture to have written it well, and if, as he plans, it shall all appear within a year from the time when we are privileged to open the first volume, he will have shown an administrative faculty, that, in botanical book-making in this country, stands alone, except for Dr. Britton's prompt publication of the illustrated flora of our eastern states, which several times found mention in these columns a few years ago. Of course he would not have been able to effect this prompt publication unaided, and no small credit for the result attaches to his energetic collaborator, Mr. Miller; and well as he might have written it, he would not have done it alone so authoritatively as he has done it with the aid of corps of specialists, comprising the best botanists and the most expert gardeners of the country, whose names occupy several pages of double column matter at the beginning of the book, and behind whom stand still other helpers whose names at their own request do not appear, though his readers get the benefit of their knowledge.

I suppose that it is impossible for the most rational of men to open a book without finding in it more than they expected, or to lay it down without a sigh of regret at the absence of something that they wanted to find. Professor Bailey's book is not different from other books in these respects. Open it where you will, and you find a tasty cut or a catching paragraph which holds your attention and gives you something you had not intended to look for. And yet if you are an every-day gardener and want to distinguish the different varieties of chrysanthemum or carnation, of apricot or cauliflower, you may fail to find there the means of doing so.

Where races differing from one another more than many species do in nature are made to order, almost to drawing and specification, on a few years' notice, it is very difficult either to find space for their description in a book of any reasonable size or phraseology that can supply to the ordinary reader the distinctions that are patent to the eye of the specialist. The editors have therefore, without doubt, done wisely in a very conservative treatment of these necessarily transient forms, which pass from view as a rule almost as suddenly as they appeared with gorgeous lithographic depiction in the catalogues

of dealers. But the editors have done something with them, and they have handled the more lasting forms with a rather surprising fulness of treatment.

Nomenclature, which is a source of some concern and more confusion to botanists, has been conformed, more or less consistently, to the more conservative horticultural and botanical views. It could not give satisfaction in any case, and it has at least the merit of simplicity as it has been handled.

In a word, whatever one would most reasonably look for in a Cyclopedia of American Horticulture, is to be found in Professor Bailey's book. While good things may have been omitted from it, the present reviewer has not found bad things that have been introduced into it; and it is worthy of a place where not only gardeners and botanists, but school-children may see it daily.

Wm. Trelease.

La nature tropicale. By J. Constantin. Paris, Felix Alcan, Ed. Pp. 315, figs. 166. 1899.

The first chapter of this book is chiefly comprised of selections from the expressions of various naturalists on their first encounter with the forests and jungles of the tropics, and the second analyzes the principle factors in the equatorial climate. Succeeding chapters are devoted to trees and their architecture, foliage, periodicity, flowers and fruits, the tropical forest in previous geological epochs, climbers of all kinds, parasites and parasitic action of flowers, saprophytes and epiphytes, co-operation of ants, influence of the sea, the mangrove, the flora of islands and the final chapter is a singular mixture of fanciful conceptions relative to the earlier history of the earth and the cosmos, with enough of an admixture of mythology and tradition to endear it to readers of tender years. The general style of the book is not unpleasant, and although most of it might have been written a decade since, yet some recent results have crept into the discussions, especially in regard to the more sensational discoveries in botany. A table of contents placed at the end of the book does not redeem the lack of a suitable index.

D. T. MacDougal.

Fossil Flora of the Lower Coal Measures of Missouri. By David White. Monographs of the United States Geological Survey, Vol. XXXVII. Washington. 1899. 4to, cloth. Pp. 467; pls. 73.

This work is based upon material collected by Dr. J. H. Britts and by geologists of the Missouri and United States Geological Surveys, in Henry county, Missouri.

It may be regarded from either the point of view of the geologist or from that of the paleontologist, but it is essentially a contribution to paleo-botany in which the facts are utilized for purposes of correlation and comparison between the coals of Missouri and those of the Eastern United States and Europe.

The species enumerated are 124. Of these 10 are gymnosperms, 1 (*Palaeoxyris*) is classed provisionally under 'Animalia?' and the remainder are cryptogams, most of them previously described. The discussion and table of synonomy under each genus and species is exceedingly full and a number of changes in nomenclature are made in order to bring it into harmony with modern ideas on the subject. The systematic arrangement is in accordance with the botanical affinities and sequence of the species and families.

Several innovations may be noted in the matter of illustrations. The figures are mainly reproductions of photographs of the rock containing the species, accompanied by drawings of portions of the species in which details of outline, nervation or fructification, etc., are shown. This method gives a good general idea of the actual appearance of each specimen as a whole together with the particular features which require emphasis, but such plates are not equal, for purposes of exact study, to reproductions from carefully made drawings, as may be seen by a comparison between Plates XL. and XLI. Another innovation which has produced excellent results is in the line of enlarged photographic reproduction, an example of which may be seen on Plate LI.

In the final discussion of the flora there are tables of distribution, for purposes of comparison with other coal floras and the conclusion is reached that the stratigraphic position of the Henry county coals is subsequent to the lower

coals of the Lower Coal Measures of the East, including the Morris or Mazon Creek coal of Illinois and the Brookville or Clarion coal of Ohio and Pennsylvania, but previous to the Darlington or Upper Kittatinning coals of the latter States. A comparison with the British coal flora indicates that the flora of the Henry county deposits is represented to a greater extent in the Upper and Middle Coal Measures of Great Britain than in the Lower; probably in age about that of the basal portion of the Upper Coal Measures of that country. Interesting comparisons are also made with the coal floras of Continental Europe. It is to be regretted that in this, as in all similar large works, many of the finer points in comparative biology are necessarily omitted or else are more or less hidden in the mass of the systematic arrangement. There is no doubt that several of the species are capable of even more critical treatment that is given to them, but every one must recognize that the author has performed an immense amount of investigation and has produced a work of permanent scientific and economic value. ARTHUR HOLLICK.

Analyse microchimique et spectroscopique. By M. -E. POZZI-ESCOT. (Encyclopédie scientifique des aide-mémoire.) Paris, Gauthier-Villars, Masson et Cie. P. 192, figs. 40.

Chemists the world over, have awakened, within the last few years, to the fact that the microscope is a most valuable accessory to every laboratory of chemical analysis. This increasing interest has been remarkably slow considering the almost inestimable value of this instrument as an aid in chemical research. The failure, in the past, to make use of the microscope has been, doubtless, due to two causes: first, the fact that instruction in the use and manipulation of this instrument has not been, heretofore, included in the courses of study offered to students fitting themselves for chemists in the various educational institutions; second, there has been a lack of suitable text-books, manuals, etc. The latter cause has been eliminated by the recent publication of several works. Of these the latest is the little compend of M. Pozzi-Escot published under the title given above. The appearance of this outline of the methods of microchemical analysis can be taken as indicating an increasing appreciation of the great value of the microscope to chemists, and friends of the system will, therefore, gladly welcome the little book although it is almost entirely a compilation of methods and reactions already published. It is but fair to the author, to state, however, that the material has been well chosen and due credit has been given to the originators of the different tests and processes.

The author gives a concise review of the rise and development of microchemical analysis. Then follows a description of the requisite apparatus and reagents, the tests for the different elements, and finally a more detailed discussion of the methods to be employed in the systematic analysis of unknown substances.

It is greatly to be regretted that the elements have been arranged in alphabetical order and that no details are given as to the way of applying the tests, nor (save in a few cases) of the causes which may lead to their failure. Any attempt to make microchemical analysis a purely mechanical matter is certain to give the beginner no end of difficulty and, moreover, is apt to mislead him into the idea that a knowledge of chemistry is not an essential in the interpretation of the tests obtained.

Reactions for sixty-three elements are given, most of which are satisfactory and are illustrated by original or copied drawings of the crystals to be obtained.

Chapters III. to V., dealing with the methods to be employed in a systematic analysis, are much better than those preceding. The necessary manipulations being described in detail and cautions as to sources of error are also given. This portion of the work can be consulted with profit by all those interested in the neat and elegant methods of microchemical analysis and renders it worthy of a place in the analytical laboratory.

That part of the book devoted to spectroscopic analysis comprises only nineteen pages. It would have been better had the author omitted this section entirely and devoted the extra space to a more thorough discussion of reactions and to an index. E. M. CHAMOT.

CORNELL UNIVERSITY.

Qualitative Analysis for Secondary Schools. By Cyrus W. Irish, A.B. (Harvard), Head master of the Lowell High School, Lowell, Mass. American Book Company.

The preface of this book states that in secondary schools "the first half of a one year's course in chemistry should be devoted to a general introduction to the theory of the science and to a close study of the most common non-metallic radicals. The second half-year should deal with basic radicals and should be combined with the study of Qualitative Analysis." It is to supply a manual for the latter part of such a course that this little book has been written.

The laboratory work begins with a series of experiments, illustrating the classification of the bases into analytical groups. Metals are selected as typical of the various groups, and the action of each group reagent, in turn, upon a solution of a salt of each of these metals is studied. The metals of a group are then taken up in order, preliminary experiments being followed by a few well-chosen questions on the experiments and on the occurrence, preparation, uses, etc., of the element under consideration and its compounds.

The directions for the analysis of a group are followed by a table outlining, by the use of formulæ, the chemical changes which take place in the course of analysis. In the reviewer's opinion the preparation of such a table by the student himself, from the data secured in the preliminary experiments, is much better and is one of the most profitable exercises which can be given him. In this manual the table is followed by 'notes and suggestions' which are altogether too brief. Space might have been gained for the expansion of this part of the book, by the omission of lithium and all but the more common inorganic acids.

As is usual in manuals of qualitative analysis, the section devoted to the acids is unsatisfactory. In the test for an acid, the behavior of other acids under the prevailing conditions is disregarded. The most convenient method of preparing a solution for the detection of the acids, viz, treatment of the substance with sodium carbonate, is not directly mentioned, while there is given in full the preliminary examination of the solid substance, the results of which, in the case of mixed substances, can only be interpreted by the more advanced student.

The methods used for the separation of the bases are for the most part well-chosen. Most teachers would prefer, however, to adopt for high-school students methods for the separation of nickel from cobalt and of copper from cadmium, which do not involve the use of potassium cyanide. The directions for the precipitation of the copper group (p. 36) are faulty in that they favor the incomplete transformation of mercuric compounds into the black sulphide, which will frequently result in a precipitation of mercuric sulphide in the final test for cadmium. On page 42 occurs this misleading paragraph, "Boil stannous chloride with concentrated nitric acid. This converts the stannous chloride into stannic chloride."

The introductory chapter lacks the lucidity of style which should characterize an elementary text-book. The statements, "the specific name of a salt is the name of the basic radical changed to an adjective" (p. 8), and "substances that are in solution can be separated by addition of such a reagent as will form a new substance that is insoluble in the fluid" (p. 12) will surely appeal to the high-school pupil as little as does the following prescription to the chemist, "for Alkali Burns, apply acetic acid diluted with water so that to the taste it is about one-fourth as sour as vinegar. This solution may be safely applied to the eye" (p. 15).

Notwithstanding these faults, the book might produce good results in the hands of an experienced teacher of chemistry. Whether a year's course in chemistry in a secondary school may not be profitably spent in a thorough and extended study of what is usually called general chemistry to the exclusion of anything more than the merest elements of qualitative analysis, is another question.

Theodore Whittelsey.
Cornell University.

The Psychology of Religion. An Empirical Study of the Growth of Religious Consciousness. By Edwin Diller Starbuck, Ph.D., As-

sistant Professor of Education at Leland Stanford Junior University. With a Preface by WILLIAM JAMES. London, Walter Scott. 1899. Pp. xx + 423.

Within the last decade a number of articles have appeared that center about the religious phenomena of adolescence and point the way toward a scientific religious pedagogy. Two of these were by Professor Starbuck (*Am. J. Psy.*, VIII. and IX.), and out of them, by the help of improved methods and of largely increased data, the present volume has grown. Part I. treats of conversion, Part II. of religious growth not involving conversion, and Part III. of the essential unity of the two lines of growth. It is shown that conversion is essentially an adolescent phenomenon, that parallel experiences occur where strong upheavals are absent, and that these experiences in their totality are intimately related to the bodily and mental phenomena connected with puberty. The general outcome is a clear exhibition of the various ways in which the religion of childhood gives way to that of maturity.

The study is purely empirical. In fact, its freedom from all apparent consciousness of dogma is rather remarkable. The data consist of statements of personal experience from more than 400 persons who have replied to question list circulars. The fact that nearly all the respondents are American Protestants and that the research concerns the adolescent period almost exclusively, suggests a question whether the title is not somewhat too broad for the contents of the book. It is only fair to say, however, that the data have been so related to physical and mental laws as to display general rather than merely special tendencies. The manipulation of the returns has been very skilful. In spite of the necessary defects of material derived from what untrained observers tell about their own mental states, the broader features of growth—those upon which general pedagogical practice must be based—are adequately set forth.

The volume is significant of new scientific attitudes and occupations. It means nothing less than that the *modus vivendi* with theology whereby two supposedly distinct fields of study were delimited, has come to an end. Theology moved in this direction when it adopted scientific methods in the study of the Scripture and in the history of religions. And now science also throws off her reserve and, agreeing with Karl Pearson that wherever facts can be observed and compared, there is the realm of science, assumes that 'there is no event in the spiritual life which does not occur in accordance with immutable laws' (Starbuck, p. 3).

However much this may look like an 'invasion' of religion by science, it is, in fact, in logical harmony with the theology of divine immanence, which denies the mutual exclusiveness of the natural and the supernatural and finds it worthy of supreme intelligence that nature and mind should proceed by orderly sequence. It is certainly to be hoped that both theologians and men of science will take this view of the matter, and thereby avoid such unfortunate squabbles as accompanied the adoption of the new geology and of the evolution hypothesis. On the side of science all that is required is that law be understood in the sense of uniformity and not in the sense of a controlling necessity.

There are three reasons for expecting that studies like this will be assimilated by religious thinkers with some degree of readiness. The first is that the contest over geology and evolution has taught its lesson. The second is that Starbuck's spirit and attitude show no trace of antagonism to religion or religious beliefs. A third reason is that the book furnishes a preliminary basis for a sound religious pedagogy and contains tools capable of being used for religious propagandism. The 'dead hand' of false method has been upon the practical work of the churches as truly, if not as fully, as upon their theology. Analysis of human nature as it presents itself to observation has scarcely been heard of except in the training of Jesuits, and here it is only a device for attaining certain prescribed ends. The Protestant churches, at least, will find their interest in promoting such studies as that before us. Denominational colleges will find that they have a special call to prosecute them, and in the end we may hope to see shambly Sunday-school methods and hit-or-miss evangelism superseded by a reasonable system of religious training and an evangelism

that has conscious respect for ascertainable facts of human nature.

The effect of the ancient misunderstanding between science and religion could not be slight. In early Greek thought what we now call science was all one with what we now call philosophy and with the intellectual side of religion. The sciences have been completely segregated from other intellectual interests, in fact, scarcely more than a century. No doubt science and religion have both gained by the separation, but it may reasonably be asked whether their going apart, is not, after all, a merely temporary expedient to enable the intellect to regain its unity upon a higher plane.

George A. Coe.
Northwestern University.

BOOKS RECEIVED.

The Cell in Development and Inheritance. Edmund B. Wilson. New York and London, The Macmillan Company, 1900. Pp. xxi + 483.

Lehrbuch der Zoologie. Richard Hertwig. Jena, Gustav Fischer, 1900. Pp. xii + 622. 11 Mark, 50 Pf.

Catalogue of the Fossil Bryozoa in the Department of Geology, British Museum (Natural History), Volume I. *The Cretaceous Bryozoa.* J. W. Gregory. London, The British Museum, 1899. Pp. xiv + 457 and seventeen plates.

Catalogue of the Arctiadæ. Sir George F. Hampson. London, The British Museum, 1900. Pp. xx + 589.

A Monograph of Christmas Island, Physical Features and Geology. Charles W. Andrews. London, The British Museum, 1900. Pp. xiii + 337. A map and twenty-two plates.

Anatomie et physiologie végétales. Er. Belzung. Paris, Alcan, 1900. Pp. iii + 1320.

Micro-organisms and Fermentation. Alfred Jörgensen. Translated by Alex. K. Miller and A. E. Lennholm. London and New York, The Macmillan Company, 1900. Pp. vi + 318.

SCIENTIFIC JOURNALS AND ARTICLES.

The *Journal of the Boston Society of Medical Sciences* for April opens with an abstract of the 'Histology of Acute Pneumonia,' by Joseph H. Pratt, giving a summary of the examination of fifty cases. G. B. Magrath has a preliminary study of 'The Relation of Age, Physique, and Preliminary Training to Class Rank in Pathology,' training not unnaturally seeming to have the most marked bearing on scholarship. F. P. Denny presents a 'Report on the Examination for Diphtheria Bacilli of Cultures from Four Hundred and Seventy-five Individuals,' an important conclusion being that while such bacilli are rarely present in healthy persons, a large number may be infected by healthy individuals who *do* have the bacilli in their throats. J. H. Wright describes 'A Case of Multiple Myeloma,' and Franklin Dexter has some 'Additional Observations on the Morphology of the Digestive Tract of the Cat,' while Wm. Hallock Park gives the results of 'A Few Experiments upon the Effect of Low Temperatures and Freezing on Typhoid Bacilli,' showing that they possess great powers of endurance and that infection may be caused in spring by fecal material thrown out in winter. The final paper, by E. W. Taylor, describes a case of 'Diffuse Degeneration of the Spinal Cord.'

The *Popular Science Monthly*, established in 1872 by Messrs. D. Appleton & Co. and Dr. E. L. Youmans, will hereafter be published by Messrs. McClure, Phillips and Company and edited by Professor J. McKeen Cattell. The table of contents for June is as follows:

Professor Wolcott Gibbs, President of the National Academy of Sciences. (Frontispiece.)

Preventive Inoculation. (1) Dr. W. M. Haffkine.

Professor Ewart's Penycuik Experiments. (Illustrated.)

Colonies and the Mother Country. (1) James Collier.

The Future of the Negro in the United States. Professor N. S. Shaler.

The Physical Geography of the Lands. Professor W. M. Davis.

The New York Botanical Garden. (Illustrated.) Dr. D. T. Mac Dougal.

Gas and Gas Meters. (Illustrated.) Hubert S. Wynkoop.

The Sun's Destination. Professor Harold Jacoby.

A Biographical Sketch of an Infant. Charles Darwin.

Correspondence: Comparative Longevity and Greatness. Professor Joseph Jastrow. School Reform.

Scientific Literature: Chemistry; Zoology; Botany; Anthropology.

The Progress of Science: The Retiring President of the National Academy; The Work of the Academy; The American Association; An International Assembly; A National Physical Laboratory; The Promotion of Men of Science; Recent Deaths; The Solidification of Hydrogen; Chemical Fertilization; The Approaching Eclipse.

SOCIETIES AND ACADEMIES.

THE NEW YORK SECTION OF THE AMERICAN CHEMICAL SOCIETY.

AT the regular meeting of the New York Section of the American Chemical Society, held May 12th at the Chemists' Club, the following papers were read:

C. W. Volney: 'New Extraction Apparatus.'

C. W. Volney: 'Artificial Musk.'

P. A. Levene: 'Modern Researches on the Chemistry of the Proteid Molecule.'

J. A. Mathews: 'Calticyanides of Bismuth.'

Dr. Volney's artificial musk was exhibited and caused considerable discussion. It is said to be a compound belonging to the paraffine series, and therefore a distinct departure from the idea that an artificial perfume must contain the 'benzol ring.' No analysis was given nor particulars of the method of preparation, these being reserved for a future communication.

Asked whether his musk is composed of a saturated or unsaturated paraffine compound, Dr. Volney said it is saturated.

Dr. Schweitzer said that so far as he knew, it had never been claimed that an aromatic group was necessary in the synthetic musks. Patents had been taken out for a variety of processes, some for preparing musks by nitrating resins, among them ordinary rosin; but when the inventor had been asked to supply his musk on a large scale he had furnished 'musk Baur.'

Dr. Stearns claimed that nitrated bodies do not smell of true musk. Different persons, he said, are differently affected by the true musk odor, and many are incapable of deciding that an imitation is a good representative of the true odor. In this way many substances were called artificial musk which would not pass even an arbitrary set of tests. It is not yet known what the essential element of true musk is, or whether it is pre-existent, or is formed by a slow chemical change in the constituents of musk material. Baur has examined musk to determine whether nitrated bodies were present, but found none.

Dr. Levene's paper was an interesting review of the work which has been done and the views which have been held during the past two years on the chemistry of the protein compounds and the classifications of their constituents.

In regard to the sulphur in their composition, he said it evidently existed in two forms or conditions of combination, one molecule being separable as hydrogen sulfide, the other remaining.

Dr. J. A. Mathews described an investigation of the cobalticyanides of bismuth designed to develop a process for separation of bismuth in analytical work, for instance in the analysis of pig and refined lead. The conditions under which such an analysis are carried out were found, however, to prevent the complete precipitation of bismuth as cobalticyanide, and as yet he had not been able to make the practical application of the study of these salts which had been hoped for.

The meeting was addressed by Professor Rising, of California, who said that much interest was manifested by the chemists of the Pacific coast in becoming members of the American Chemical Society, and an application for a charter would soon be made.

Dr. McMurtrie, president of the Society, was present, and, invited to take the chair, said that in view of the approaching general meeting it was necessary that each member should bring out whatever subject he had in readiness for publication in time to have its title announced on the program. All such titles should be transmitted to the General Secretary, A. C. Hale, 551 Putnam Avenue, Brooklyn, N. Y., as early as practicable, to facilitate the preparation of the program and to enable the committee to arrange sufficient time for the sessions.

Dr. Doremus announced the full list of sections and ground covered thereby in the congress of chemists to be held at Paris in July; also that titles of papers to be presented there should be forwarded not later than June 1st.

DURAND WOODMAN,
Secretary.

CHEMICAL SOCIETY OF WASHINGTON.

THE regular meeting was held April 12, 1900.

The first paper of the evening was read by Mr. J. K. Haywood, and was entitled 'The Analysis of the Arsenical Insecticides.'

The paper consisted of the comparative study of various methods proposed for the analysis of these preparations.

The second paper of the evening, which was presented by Dr. H. C. Bolton, entitled 'A Claim for Priority,' was read by the Secretary.

The Journal of the American Chemical Society for March, 1900, contains a paper by Joseph W. Richards and Norman S. Powell, entitled 'Substitutes for Hydrochloric Acid in Testing Carbonates'; the authors find that potassium acid sulfate, oxalic acid, citric acid and tartaric acid can be used in testing carbonates, producing effervescence more or less actively and they give a table of results. The authors make no reference to previous work on the same lines, and this prompts me to claim that about twenty years ago I anticipated all their observations and published the results in periodicals accessible to everyone.

Between 1887 and 1882 I published three memoirs under the title 'Application of Organic Acids to the Examination of Minerals,' in which I showed the action of these acids on 200 mineral species, including carbonates, sulfids, oxides, silicates and many others. I pointed out the usefulness of citric acid as a substitute for hydrochloric acid in the laboratory and in the field, and showed that by means of it certain minerals could be readily distinguished.

These papers were printed in whole or in part in the following journals: *Chemical News*, Vols. 35, 36, 43 and 47; *Annals N. Y. Acad. Sciences*, Vols. I. and II.; *Proceedings American Assoc. Adv. Science*, Vol. 47; *Reports Brit. Assoc. Adv. Science*, Vol. 50; *Mineralogical Mag.*, Vol. IV.; *Berichte d. d. chem. Ges.*, Vol. XIII.; and abstracts appeared in many other journals. Moreover, the use of citric acid in testing minerals was adopted by teachers in more than one scientific school, the use of potassium acid sulfate having been long known before. Finally, Nason's edition of Elderhort's *Manual of Qualitative Blowpipe Analysis* (1881) gives a whole chapter to my method.

It is gratifying to note that the results obtained by Richards and Powell agree well with mine. Coincidences of independent thought often occur, but in publishing a research some acknowledgment of previous work is generally made; had the authors made even a slight examination of familiar literature they would have found that their field of study had been thoroughly traversed.

The third paper was read by Dr. Cameron and was entitled, 'The Estimation of the Carbonates and Bicarbonates of the Alkalies,' by F. K. Cameron and L. J. Briggs.

The last paper was read by Dr. Cameron and was entitled 'The Solubility of Calcium Sulfate in Solutions of other Salts,' by F. K. Cameron and F. D. Gardner.

Mr. Chestnut exhibited specimens of plants used by the Indians in California to stupefy fish which they use for food.

An adjourned meeting was held at Hopkins Hall, Johns Hopkins University, Baltimore, Md., on April 21, 1900.

Dr. Remsen welcomed the society and explained that the Chemical Department of the University is now undergoing repairs after damage by fire. He gave an interesting account of the work in progress under his direction in the University laboratory.

The first paper was read by Dr. Simon and was entitled 'A Storage Vessel for Solid Carbon Dioxid.' The author exhibited an improved vessel, which he had designed and which is giving universal satisfaction in the transportation of such materials as solid carbon dioxid and liquid air. In connection with the vessel he exhibited some solid carbon dioxid which had been placed in it the day before and showed that there had been very little loss.

Professor Morse read a paper on the preparation of permanganic acid, in which he discussed various methods and showed that the electrolytic method had been most satisfactory. He described in detail the apparatus used in his laboratory for carrying out this method.

Dr. Bolton presented a paper entitled, 'An Experimental Study of Radio-active Substances.' The paper was illustrated with photographs taken with Radium light.

The last paper of the evening was read by Dr. F. W. Clarke and was entitled: 'The Action of Ammonium Chlorid on Certain Silicates' by F. W. Clarke and George Steiger.

A brief outline of the method of decomposition of some zeolites by heating with ammonium chloride in a sealed tube, was first given. It was shown by the experiments that two of the formulæ hitherto given, to Scolecite, Natrolite and Prehnite must be abandoned. Scolecite and Natrolite give almost identical ammonium compounds, calcium having been replaced in the one case and sodium in the other. They also show these two zeolites to be probably salts of orthotrisilicic acid. In the case of Prehnite the results were quite different, two experiments giving only .17 per cent. in the one case and .22 per cent in the other, of ammonium, in the product formed by their treatment. This different action shows that Prehnite can no longer be classed with the former two. In the case of Pectolite the results were so irregular that definite conclusions could not be drawn from the facts at hand. Some figures were given and a formula suggested.

WILLIAM H. KRUG,
Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 325th regular meeting, the last for the season, was held on Saturday evening, May 19th. Mr. C. H. Townsend spoke at length on 'The Recent Cruise of the *Albatross* among the South Pacific Islands, with Remarks on the Inhabitants and their Customs,' illustrating his remarks with numerous lantern slides. The speaker described the route followed, the method of sounding and dredging, and noted the additions made to our knowledge of the depth of the ocean. The peculiarities of some of the islands were given, including those of the typical atolls. Mr. Townsend then described the inhabitants of some of the groups of islands visited, calling attention to the fact that each group possessed its own type of house and canoe. In conclusion the speaker gave an account of his trip across the island of Fiji, giving high praise to the manner in which the group was ruled by the English.

F. A. LUCAS.

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 305th regular meeting of the Anthropological Society was held Tuesday, April 24, 1900.

The meeting was designed as a memorial of Frank Hamilton Cushing, Vice-President of the Section of Technology, whose recent death had deprived the Society of one of its most brilliant members.

The following resolutions, prepared by a committee of the Board of Managers of the Society, were presented:

WHEREAS, Our colleague and friend, Frank Hamilton Cushing, Vice-President of the Section of Technology in the Anthropological Society of Washington, has been removed from our midst by death—

Resolved, That the members of the Anthropological Society of Washington unite in an expression of deep sorrow at his untimely death. An enthusiastic investigator, an acute observer, a genius in grasping the thoughts of primitive men, a master in exposition, and a tireless worker, his contributions to the science of man are many and brilliant.

To unravel and correlate the fading myths of a well nigh extinct race, he gave the best years of his unselfish life, braving disease, danger and death itself in his work as a pioneer; and in his death while yet in his prime and in the midst of his noblest work the science has suffered a grievous loss. An active member of this Society from its foundation, he was a frequent contributor to our proceedings; his contributions were of surpassing originality, embodying rich and unique experience and the results of profound study, always expressed in felicitous form; so that his death closes forever one of our richest sources of instruction and inspiration.

The loss to the science and our Society is a loss to mankind; the world is poorer to-day because the life of Frank Hamilton Cushing has passed from it.

To his bereaved family and sorrowing friends we tender our heartfelt sympathy.

J. H. MCCORMICK,
P. B. PIERCE,
W. H. HOLMES,
Committee.

Addresses giving various phases of Mr. Cushing's life and work were then made by President W J McGee, Major J. W. Powell, of the Bureau of Ethnology, in which Bureau Mr. Cushing was a brilliant worker, Mr. L. O. Howard, Secretary American Association for the Advancement of Science, who was a classmate in Cornell; Professor W. H. Holmes, spoke of his work for the National Museum; Mr. Stuart Culin, of his researches in behalf of the University of Pennsylvania; Mr. J. D. McGuire, of his genius in the technological and archæological field; Dr. Washington Matthews, of his discoveries in Zuni and the Salado Valley and of his organization and explorations with the Hemenway expedition; Mr. P. B. Pierce, of his character as a personal friend; Miss Alice C. Fletcher, of Mr. Cushing's wonderful mind and his ability to discern similarities and forge the connecting links between the thoughts of primitive man and the archæic remains with which he was surrounded. The consensus of opinion was that Mr. Cushing occupied a field peculiarly his own and that he ranked as one of the few real geniuses of the world.

Letters of regret were read from Dr. Franz Boaz, of the American Museum of Natural History and Mr. Wm. Wallace Tooker and Wells M. Sawyer.

The resolutions were adopted by a rising vote.

J. H. McCormick.
Secretary.

DISCUSSION AND CORRESPONDENCE.

HUMANIZING THE BIRDS.

Bird Lore for December last contained an excellent article by Caroline G. Soule, entitled 'Humanizing the Birds,' and protesting against the too common practice of ascribing to them human qualities which they do not possess and mental traits with which they are not endowed. The title might well serve as the text for a long discourse on the subject, for there is all too much of this 'humanizing' indulged in now-a-days, not only by those who write about birds, but by writers in all branches of natural history, and it is not confined to stories written for the instruction of small children, but in articles intended for the edification of children of a much larger growth. Writers on evolution are all too prone to humanize their subjects, and it is so favorite a sin with those discussing problems of mimicry that in his *Dictionary of Birds* Professor Newton follows that caption 'with the prefix UNCONSCIOUS, which in every department of zoology should always be expressed or understood.' For it is a common fault to make the mimicking process active instead of passive, to say, for example, that "Many butterflies escape destruction by mimicking the colors and markings of uneatable forms," as if the butterflies had given serious thought to the matter. When an author writes that "Butterflies are often attracted by the excreta of birds and a spider takes advantage of this fact to secure his prey," he implies a considerable amount of reasoning power in the spider. That this implication is not intended is shown a little later by the statement that "The whole combination of habits, form and coloring afford a wonderful example of what natural selection can accomplish," but the damage has been done and the suggestion made that the mimicry is intentional.

When we read that the "witch-hazel, knowing that neither boy nor girl, nor bird nor beast nor wind, will come to the rescue of its little ones, is obliged to take matters into its own hands" we realize that it was written for a child, although we may deplore this manner of writing and wish that the case had been differently stated. But here is a statement almost, if not quite as bad, taken from an important work on zoology and not written with the view of interesting a child: "In the Mediterranean the embryos [of sponges] * * * escape from the tissues of the parent when they have arrived at the blastula condition * * *, in the same species on the shores of the English Channel the young are retained until after gastrulation * * *." The explanation of this it is said is not difficult: "In the Mediterranean there are no strong currents and is evidently best for the parents to get rid of the young at as early a moment as possible, thus escaping longer drain upon its energies. In the English Channel, on the other hand, the current is very strong, and were the embryos to be set free at the stage at which they are in the Medi-

terranean the chances are that they would be swept away * * *, *and hence they are retained* (italics ours) until nearly ready for attachment to the rocks." This seems to be a direct transposition of cause and effect and credits the lowly sponge with an amount of reasoning power and a degree of intelligence that few have suspected it to possess. Why would it not have been quite as accurate and decidedly less confusing to have said that, while we do not *know*, it seems probable that in the first case we have the normal condition of affairs, while in the second there has been an elimination of those sponges whose young were turned loose into a cold world at too tender an age?

These are merely one or two examples, the first that came to hand, of a very prevalent style of writing, but they serve as typical examples of a familiar class. Such statements as these are made with a view of popularizing science by making it pleasant reading, but it may be questioned if this mode of writing does not merely fail of producing its intended effect, but creates an entirely erroneous impression in the minds of the non-scientific reader for whom it is meant. Does it not teach that evolution is not a passive but an active process, and subtly lead him to think that not only the higher, but the lower animals, even the plants, pass many anxious moments considering what they may do for the benefit of posterity? Sooner than leave such an impression as this it would seem best to cease 'humanizing the birds.'

F. A. LUCAS.

NOTES ON INORGANIC CHEMISTRY.

IN the last number of *Nature*, W. A. Shenstone and H. C. Lacell, of Clifton College, contribute an interesting paper on working silica in the oxy-gas blow-pipe flame. While Gaudin had observed the elasticity of fine threads of vitreous silica as early as 1839, it was not till Professor C. V. Boys rediscovered the valuable qualities of 'quartz threads' in 1887 that the working of silica in the blow-pipe flame became practical. The authors have done much work with silica which is described in the paper. They find it possible to make thermometer tubes of silica and express the view that the only limit in its application is the matter of expense. They note in conclusion certain properties: It is harder than feldspar, but less hard than chalcedony, and its surface appears equally hard, whether cooled rapidly or slowly; the cold vitreous silica can be plunged safely into the hottest part of the oxy-gas flame, and thick rods and tubes of silica can be heated till plastic and then plunged into cool water without injury; vitreous silica is a very poor conductor of heat and hence it is possible to hold a thick rod of silica very close to a strongly ignited zone. Great developments in chemical and physical laboratories may be expected when it becomes possible to use apparatus of silica, which, in addition to possessing an extreme resistance, will endure the greatest and most rapid variations of temperature.

IN a paper read before the Royal Society of Dublin, by James Holmes Pollok, a new deposit of kieselguhr is described as occurring in County Antrim, along both banks of the Lower Bann from Toome Bridge, where the river emerges from Lough Neagh, down to Coleraine at its mouth. The deposit rests on peat and is only covered by vegetation. In places it is four feet in thickness. After drying in the sun, the material is pure white, porous and very light, the specific gravity of the mass being only 0.5422. The deposit is probably now being augmented when the river overflows its banks, and is largely composed of cubical diatoms from Lough Neagh.

A PAPER in the *Zeitschrift für anorganische Chemie*, by W. Hempel and v. Haasy, on amorphous silicon brings out several new facts in an old subject. By the action of sodium on the fluorid of silicon and subsequent fusion of the powdered mass with aluminum, a very active form of amorphous silicon is obtained on dissolving out the aluminum. This silicon burns very readily when heated gently in the air. Heated in chlorin it gives easily silicon chlorid. By direct union with sulfur, silicon disulfid is formed, which is purified by sublimation, forming long white needles, similar to the product described by Sabatier as being formed by heating silicon in a current of hydrogen sulfid. On fusion with sodium sulfid, sodium metathiosilicate Na_2SiS_3, is formed corresponding to so-

dium thiocarbonate. When treated with chlorin the chlorids of sulfur and silicon are formed and this reaction is used by the authors to detect thiosilicates in natural and artificial silicates. Thus they find 0.007 per cent. of SiS_2 in Vesuvius lava, up to 0.1 per cent. in different blast furnace slags, and 0.174 per cent. in ultramarine. They suggest that the sulfur in many sulfur springs may be due to the decomposition of thiosilicates.

The last *Chemical News* contains the translation of a paper on krypton, communicated to the Berlin Academy by Professor Ludenburg and Professor Kruegel, of Breslau. Availing themselves of the possibility of obtaining larger quantities of liquid air, they examined the residue of 850 liters. These liters of this liquid residue gave 2300 liters of gas which was freed from oxygen and nitrogen. The final residue of 3.5 liters of gas was condensed in liquid air and then fractioned. The earlier fractions were chiefly argon, though even the second of the six fractions showed clearly the green krypton line. After the fifth fraction was boiled off there remained a crystalline residue melting at about —147°. The gas in this fraction proved to be nearly pure krypton, though some argon lines were present in the spectrum. Ramsay had suggested for krypton the density of 80–82, but two determinations with Ladenburg's krypton gave 58.67 and 58.81, using about 16 c.c. of the gas which had been crystallized. The authors suggest for the inert gases a position before Group I. as follows: Helium = 4 before lithium, neon = 20 before sodium, argon = 39 before potassium, and finally krypton = 59 before copper. The authors are continuing their researches which promise interesting results.

J. L. H.

CURRENT NOTES ON PHYSIOGRAPHY.

THE DIVERSION OF THE YELLOWSTONE.

The questions raised by the unequal development of different parts of the Yellowstone drainage system within the National Park, as shown upon the topographic maps of the U. S. Geological Survey (see Science, V., 1897., 577), are answered by J. P. Goode in an article on 'The Piracy of the Yellowstone' (*Journ. Geol.*, vii, 1899, 261–271). It is there explained that the postglacial discharge of Yellowstone lake, when it stood about 200 feet higher than to-day, was orignally southwestward through a deep notch between Overlook and Channel mountains to the head of Snake river. The lower part of the canyon by which the lake is now discharged northward was then like its several neighbors in the rhyolite plateau, occupied by an active stream whose length was increasing by headward erosion. More favored than its fellows, this stream happened to gnaw through the divide that previously enclosed the lake basin and thus the waters of the lake were diverted to a northward discharge. The canyon was rapidly deepened, and the former outlet to the Snake river was abandoned. To-day the floor of the old outlet is poorly drained; puny streams start on its marshy course and flow to the opposite oceans. The falls in the new canyon are ascribed to the resistance of an undecomposed portion of rhyolite, on which the erosion of the river is retarded.

This essay does not explain the origin of the deep channel by which the lake was discharged to Snake river. The mountains in which the channel was cut seem to have been originally much higher than the divide through which the Yellowstone canyon has recently been eroded. On this point we may have fuller details in the expected Survey monograph on the Yellowstone Park.

MILL ON SOUTHWEST SUSSEX.

Dr. H. R. Mill, librarian of the Royal Geographical Society of London, proposed several years ago that a detailed geographical description should be prepared for the sheets of the one-inch English ordnance survey (see Science, III., 1896, 799). He has now made a first contribution to the scheme in 'A Fragment of the Geography of England: Southwest Sussex' (*Geogr. Journ.*, xv, 1900, 205–227, 353–373), a compendious account of the various features of that interesting district. The essay and its illustrations are excellent in many respects, and called forth deserved praise when presented at a meeting of the Society; but the pages that are concerned with physiography leave something to be desired, inasmuch as they do not cover their subject broadly or uniformly. The

'fragment' includes a part of the South Downs, a monoclinal ridge of chalk that forms the southern enclosure of the denuded area of the Weald. The ridge is trenched by the consequent valley of the Arun, an excellent example of its class; yet the Arun is merely said to be 'a typical river of the Weald,' leaving the uninformed reader entirely in the dark as to the features that it typifies, although a paragraph is allowed to the no more important matter of a comparison of Selsey bill, with two other salients of the south coast. The beautiful meanders of the Arun in its transverse valley through the Downs are passed over without explanation and without reference to similar features elsewhere, although the square cross-roads of Chichester are interestingly explained as of Roman origin, and the mean values of hours of sunshine and of atmospheric pressure are properly stated in relation to the values that obtain in other parts of Britain. As to the origin of the Arun valley, we find only the skeptical statement that it "might possibly be explained by supposing that the river * * * course was determined by the original dip slope of the Wealden Dome." Cocking pass, a notch in the Downs west of the Arun gorge in all probability marks the former path of a consequent stream whose head-waters have been diverted to the Arun system by the subsequent Rother, yet no mention is made even of the possibility of such a change, although space is found for Reid's venturesome theory that the dry valleys of the Downs were formed during 'the end of the glacial period,' when the usually pervious chalk 'was frozen into hard and impervious rock in which the torrents resulting from the melting of the higher snow cut out the valleys'; no consideration being here given to the work of ordinary subaërial erosion on the chalk during a preglacial time that was long enough to witness the excavation of the interior lowland of the Weald.

Dr. Mill's paper contains a large amount of well chosen and well presented material. It will probably be taken as a model upon which later essays will be framed. It is therefore all the more to be regretted that physiographic description was not more fully and systematically supplemented by explanation, and that the many local types of land and water forms were not presented as members of their class, rather than as (apparently) isolated examples.

THE PESCADORES ISLANDS.

The Pescadores or Hoko islands, lying between Formosa (Taiwan) and the Chinese coast, are described by Koto (Notes on the Geology of the dependent isles of Taiwan, *Journ. Coll. Sci., Imp. Univ., Tokyo*, xiii, 1899, pt. 1) as the ragged remnants of a series of nearly horizontal basalt sheets with intercalated strata of supposed Tertiary age. The islands and islets, 57 in number (besides countless reefs and ledges), are low and tabular or mesa-like, with deep weathered soil on the uplands. Their original area has been much lessened erosion, especially by the attack of the waves, as the uplands descend to the irregular shore line in steep slopes, broken at different levels by the edges of thin basalt sheets. The surface is barren and desolate, 'a quasi-desert, and not an oasis, amidst the green island-world of south-eastern Asia,' a condition that is attributed to the savage violence of the wind, which blows from the northeast during three quarters of the year. The rains of the southwest winds in summer sink into the ground, forming few streams; erosion at present is chiefly performed by the winds and waves. Fringing and barrier coral reefs grow nearly all around the island upon the basaltic shelf.

W. M. DAVIS.

CURRENT NOTES ON METEOROLOGY.

CLIMATE OF SAN FRANCISCO.

UNDER the direction of the present Local Forecast Official of the Weather Bureau, at San Francisco, Mr. A. G. McAdie, special attention is being paid to studies of local climates in California. The *Monthly Review of Climate and Crops: California Section*, has thus lately contained reports upon the climates of Eureka, Fresno, Los Angeles, Sacramento, San Bernardino, San Diego, San Francisco, Stockton and Visalia. Now there has been issued *The Climate of San Francisco, Cal.*, as Bulletin No. 28, of the Weather Bureau, prepared by A. G. McAdie and G. H. Willson. The records which have been studied go back, in the case of the monthly and

annual rainfalls, to 1849, while the temperature record begins in 1871. The warmest month at San Francisco is September, with 60.9°, the coldest is January, with 50.1°. The highest temperature ever recorded was 100°, on June 29, 1891, and the lowest was 29°, on January 15, 1888. A comparison of the observations at San Francisco with those made at the Weather Bureau Station at Mt. Tamalpais (2373 ft.) brings to light several interesting facts. During June, 1899, the temperature *rose* at the average rate of 1° in every 203 feet of elevation between San Francisco and the mountain station. Fogs seem to occur at times of steep inverted gradients, when the temperature at 2500 feet is considerably higher than at sea level. The annual rainfall is 23 inches. The largest yield of crops follows a generous rainfall in March and April. The average number of clear days is 149; of partly cloudy days, 137, and of rainy days, 69.

KÖPPEN'S KLIMALEHRE.

KÖPPEN'S *Klimalehre* is a compact summary of the principles of climatology. It is a small octavo volume of 122 pages and 7 plates, and therefore cannot for a moment be compared with Hann's *Handbuch der Klimatologie* as regards completeness of presentation and breadth of view. Köppen's little book will, however, serve very well for those who wish to learn something of general climatology without going far into the subject. Considering the very limited size of the volume the matter is admirably presented. The book appears in the *Sammlung Göschen* (Leipzig, 1899. Price, 80 Pfgs.), in which collection there has already been published Trabert's *Meteorologie*, also an excellent brief discussion of the essential portions of the subject with which it deals.

DESTRUCTION OF BIRDS BY A HURRICANE.

Nature for April 5th notes a remarkable fact in connection with the West Indian hurricane of September, 1898. It appears that before the hurricane one of the tamest and commonest birds on the island of St. Vincent was a small humming-bird, but none of these birds have been seen since September, 1898. Other humming-birds, which were formerly less common than the one now missing, are still to be seen in St. Vincent, but in diminished numbers. The bird which has thus apparently been exterminated was the smallest of the three species known on the island, and hence probably also the most easily killed.

THE JUNGFRAU RAILWAY AND MOUNTAIN SICKNESS.

AN interesting note in connection with the physiological effects of diminished pressure at high altitudes is contained in an article on the Jungfrau railway, published in the *Engineering Magazine* for April. The work of construction is now being carried on very largely by Italians, but when the tunnel reaches an altitude of about 3000 meters it is considered almost certain that Swiss mountaineers will have to be employed. The latter will, it is believed, be far better able to do the necessary hard labor at the greater altitudes.

A REMARKABLE DIURNAL RANGE OF TEMPERATURE.

Ciel et Terre, for April 16th, contains a record of an extraordinary diurnal range of temperature observed in Mongolia during the year 1898 by the traveller M. Zichy. At Urga the thermometer at 5 A. M. stood at 30.2°, while the temperature at noon was 105.8°.

R. DEC. WARD.

HARVARD UNIVERSITY.

THE CONGRESSES OF THE PARIS EXPOSITION.

MORE than one hundred and fifty International Congresses, dealing with various subjects of scientific, industrial and social importance, are to be held this summer in Paris, and will form no small part of the interest of the Exposition, supplementing as they do the exhibits, furnishing the theory, as the exhibits set forth the accomplishments, of art and industry.

The delegates will be divided into three classes, those who officially represent the Government, the representatives of local and national organizations, and those who attend out of personal interest purely, the two latter classes paying a membership fee varying usually from two to five dollars. As all Congresses, even those of a permanent character of long standing, such as the Congresses of Medicine, Geol-

ogy and Chemistry, will be held this year under the auspices of the Exposition, many of them meeting within the Exposition grounds in the Palais des Congrès erected especially for this purpose. The official delegates will be accredited by the Commissioners General, acting on behalf of the president or monarch of their respective countries.

Commissioner Peck has recognized the importance of this feature of the Exposition and the permanent value which comprehensive reports of the deliberations of these bodies would represent, and with this idea in view a systematic propaganda has been carried on under the direction of Professor J. Howard Gore, of Columbian University, Washington, D. C., as Director of the Department of Organization of International Congresses, with the result that about one hundred and fifty persons, eminent in their several specialties, have been accredited as delegates. In this work the Governmental Departments have been first consulted, then local and national organizations and individuals.

It is suggested that all men of science who attend these congresses, in whatever capacity, register at the office of the Director, at No. 20 Avenue Rapp, Paris. Those in charge will take pleasure in giving all information in their possession concerning the programs, places of meeting, proposed fêtes and excursions in connection with the Congresses, etc., and may thus be able to put persons with whom they have not previously corresponded, in touch with such Congresses as may be most congenial and profitable.

We have already published details regarding many of the congresses but the following list giving the complete list in chronological order will prove useful to those visiting the Exposition this summer.

May 25–27. Horticulture.
June 4– 7. Forestry.
4– 7. Movable Property.
8–11. Joint Stock Companies.
11–13. Landed Property.
11–13. Aid Societies of Working Youth.
14–16. Teaching of Agriculture.
14–16. Numismatics.
18–21. Comparative History.
18–20. Agricultural Stations.
18–21. Cheap Dwellings.
18–25. Mines and Metallurgy.
18–23. Women's Work and Institutions.
20–23. Viticulture.
21–23. Cattle-feeding.
25–30. Insurance.
25–30. Actuaries.
25–30. Labor Accidents and Society Insurance.
26–30. Ornithology.
July. Chronometry.
1– 7. Agriculture.
8. Agriculture Co-operation.
8–10. Peoples' Credit Bank. (Loan Societies, etc.)
9. Aeronautics.
9. Automobiles.
9–13. Prisoners' Aid Societies.
9–16. Testing of Materials.
10–18. Profit-Sharing.
11–13. Workmen's Co-operative Productive Associations.
15–18. Profit Sharing.
16–18. Steam Engines, etc.
16–20. Teaching of Social Science.
17–23. Life Saving.
18–21. Commercial Schools.
18–21. Homeopathy.
18–22. International Co-operative Alliance.
19–21. Naval Architecture and Construction.
19–25. Applied Mechanics.
23–28. Meteorology.
23–28. Professional Medicine.
23–28. Photography.
23–29. Commerce and Industry.
23–28. Industrial Property Right.
23–31. Applied Chemistry.
24–29. Teaching of Living Languages.
30–Aug. 4. Architecture.
30–Aug. 4. Colonial Sociology.
30–Aug. 4. Regulation of Customs.
28–Aug. 3. Navigation.
30–Aug. 4. Tariff Regulations.
30–Aug. 4. Higher Education.
30–Aug. 5. Poor Relief.
30-Aug. 5. Public and Private Charities.
31–Aug. 4. Comparative Law.
August. Music.
Municipal Art
Stage.
2– 8. Pharmacy.
2– 5. Primary Education.
2– 5. Secondary Education.
2– 7. Philosophy.

2– 9. Medicine.
2– 9. Dermatology.
5– –. Blind.
6– 8. Deaf Mutes.
6– 8. Anti-Slavery.
6– 9. Housing.
——. Red Cross.
6–11. Colonial.
6–11. Mathematics.
6–11. Physics.
6–11. Technical and Industrial Education.
8–14. Dentistry.
9–15. Stenography.
9–11. Educational Press.
10–17. Hygiene and Demography.
10–18. Bibliography.
12–14. Alpinists.
12–15. Hypnotism.
16–28. Geology.
18–25. Electricity.
20–25. Anthropology and Prehistoric Archæology.
22–25. Psychology.
25–Sept. 1. Ethnography.
27–31. Economic and Commercial Geography.
29–Sept. 1. Teaching of Art.
29–Sept. 1. Teaching of Design.
29–Sept. 1. Teaching of Drawing.
30–Sept. 6. Physical Education.
September. Gold and Silver.
2–8. Ethnographical Sciences.
3–5. Basque Studies.
3–8. History of Religions.
5–8. Women's Rights.
6–9. Social Education.
10–12. Apiculture
10–12. Fruit Culture.
10–12. Folklore.
10–13. Popular Education.
14–19. Aquiculture and Fishery.
15–23. Railroads.
17–21. Americanists.
24–29. Fisheries.
25–28. Sunday Rest.
29–6. Peace.
October. 1–3. Maritime Law.
1–7. Botany.
Fireman (officers).
Medical Press.
Thread Numbering (textile).
Tramways (street railways).

ANTI-VIVISECTION LEGISLATION.

THE following letter from President Eliot of Harvard University to the Hon. James McMillan, Chairman of the Senate Committee of the District of Columbia, is printed in the medical journals:

HARVARD UNIVERSITY,
CAMBRIDGE, March 19, 1900.

Dear Sir:—I observe that a new bill on the subject of vivisection has been introduced into the Senate, Bill No. 34. This bill is a slight improvement on its predecessor, but is still very objectionable. I beg leave to state very briefly the objection to all such legislation.

1. To interfere with or retard the progress of medical discovery is an inhuman thing. Within fifteen years medical research has made rapid progress, almost exclusively through the use of the lower animals, and what such research has done for the diagnosis and treatment of diphtheria it can probably do in time for tuberculosis, erysipelas, cerebro-spinal meningitis, and cancer, to name only four horrible scourges of mankind, which are known to be of germ origin.

2. The human race makes use of animals without the smallest compunctions as articles of food and as laborers. It kills them, confines them, gelds them, and interferes in all manner of ways with their natural lives. The liberty we take with the animal creation in using utterly insignificant members of them for scientific researches is infinitesimal compared with the other liberties we take with animals, and it is that use of animals from which the human race has most to hope.

3. The few medical investigators can not, probably, be supervised or inspected or controlled by any of the ordinary processes of Government supervision. Neither can they properly be licensed, because there is no competent supervising or licensing body. The Government may properly license a plumber, because it can provide the proper examination boards for plumbers; it can properly license young men to practice medicine, because it can provide the proper examination boards for that profession, and these boards can testify to the fitness of candidates, but the Government can

not provide any board of officials competent to testify to the fitness of the medical investigator.

4. The advocates of anti-vivisection laws consider themselves more humane and merciful than the opponents of such laws. To my thinking these unthinking advocates are really cruel to their own race. How many cats or guinea pigs would you or I sacrifice to save the life of our child or to win a chance of saving the life of our child? The diphtheria-antitoxin has already saved the lives of many thousands of human beings, yet it is produced through a moderate amount of inconvenience and suffering inflicted on horses and through the sacrifice of a moderate number of guinea pigs. Who are the merciful people—the few physicians who superintend the making of the antitoxin and make sure of its quality, or the people who cry out against the infliction of any suffering on animals on behalf of mankind?

It is, of course, possible to legislate against an improper use of vivisection. For instance, it should not be allowed in secondary schools or before college classes for purposes of demonstration only; but any attempt to interfere with the necessary processes of medical investigation is, in my judgment, in the highest degree inexpedient, and is fundamentally inhuman.

Yours very truly,

C. W. ELIOT.

HON. JAMES MCMILLAN.

A NATIONAL REPOSITORY FOR SCIENCE AND ART.

A LECTURE was delivered at the Society of Arts on May 18th by Professor Flinders Petrie on 'A National Repository for Science and Art.' Professor Petrie, as reported in the London *Times*, said that the preservation of material for study had become an urgent question. Many of the sciences rested on proofs and bases which were partly or entirely vanishing. Looking at our present needs, and first of all those which he knew of personally, he asked where was the possibility of preserving all the new world of prehistoric man that had opened before us in the last 30 years. There was scarcely a single burial preserved intact in any museum, though they might see long rows of objects from such tombs, divorced from all else that belonged to them. We had nothing yet but stray examples of the prehistoric ages of other countries. In Egypt alone the prehistoric pottery extends to 900 varieties; when he made an offer to the British Museum he was asked to send as few as possible. To get ten square yards more in English museums was a problem. The bulk of the Greek and Latin inscriptions that we possessed was stored in cellars of the British Museum in the worst of lights. When the earliest Greek tools were offered to the British Museum they were declined as being too ugly; and they were lost beyond recall. The subject of casts was a national scandal. As to the last 1500 years the prospect was far worse. Of our own architecture there was no collection, except a small one belonging to the Institute of British Architects. There was no home for any remains of the innumerable buildings that were wiped away by modern changes. Every year the tribes of our Empire were dwindling, becoming extinct, or merging with their rulers. Our civilization had wiped out races at a greater rate in this century than in any other of the world's history. Yet there was no place where the remains of these peoples and of their civilizations could be preserved. The study of variations were only just beginning, and was the key to the great question of species. Yet series of hundreds or thousands of the same objects, however needful, however irreplaceable, could not be kept in existing museums. The larger geological specimens were scarcely ever preserved. Most of the remains of man were irreplaceable, and to suppose that the remains of all the past civilizations of the whole world were to be compressed into one square furlong at Bloomsbury was manifestly absurd. At the beginning of the century the British Museum was begun in an airy suburb. At the end it was in the midst of square miles of houses, with land of high value around it. It is hopeless to suppose that such a site could be fit for the expansion of historical material. To say that nothing should be preserved that was not worth many pounds for each square foot was to destroy all hopes of progress. Yet we virtually did so by saying "The price of preservation is £5 or £10 per square foot; perish all that is not worth so much." Two very

different classes of buildings and of conservation were, in the lecturer's opinion, required. For valuable objects of which no possible deterioration must be permitted, and which must be safeguarded from risks of theft, such buildings as our present museums were admirable. But for rougher objects and things of small individual value a much less costly and elaborate system was needed. A fine site in a city, a noble building, costly glass cases were quite inappropriate to the greater part of the material which was to be kept and studied. The system to which the necessities pointed was that of long galleries, far apart, against which much larger annexes could be attached at any point. This might be called the gridiron pattern, and the building must, of course, be placed outside of London rents. Some said: "Let us leave everything to local care; let local museums keep everything as found." They might as well leave things safely buried instead. The local museum had its own uses for elementary instruction, but no student could possibly race over the whole world to find the examples of any subject he needed. Professor Petrie suggested that a square mile of ground should be obtained somewhere within an hour's train from London at a comparatively cheap rate. It would, in a generation or so, be to Greater London what South Kensington was to the Lesser London 50 years ago. This village that would grow up around it might very appropriately be called, after the founder of the British Museum, the village of Sloane. The Sloane Galleries would soon outgrow any confusion with the little collection of Sir John Sloane in Lincoln's-inn-fields. The lecturer worked out in considerable detail the form of the galleries, the cost, the arrangements for the staff, and the fittings, and said that at first the Sloane would be the clearing ground for freeing the existing museums from everything of small value and attractiveness. That the British Museum should thus devolve the care of its contents of lesser value was a necessity that was to be met in the library by powers of very free-handed disposal to locate centers, or even destruction. Such powers in other departments were therefore to be expected sooner or later. As yet nothing could legally leave the museum, but useless lumber could be interred in the grounds. The normal average increase of the vote for the British Museum was £10,000 every four years of its history. If the proposed national repository enabled the British Museum to expand by weeding out, instead of by fresh building, the former would be paid for to all time. All that was absolutely required could be provided on the present system of expenditure if the British Museum were to be weeded during eight years of its more cumbrous and less valuable contents sufficiently to take in its new acquisitions.

SCIENTIFIC NOTES AND NEWS.

Dr. J. Willard Gibbs, professor of mathematical physics in Yale University, has been elected a corresponding member of the Paris Academy of Sciences.

The gold medal of the Linnean Society of London has been awarded to Professor Alfred Newton, F.R.S., in recognition of his important contributions to zoological science. The medal is awarded annually, alternately to a zoologist and to a botanist.

On May 8th the Prince of Wales, president of the Society of Arts, presented the Albert medal to William Crookes, F.R.S., "for his extensive and laborious researches in chemistry and in physics; researches which have, in many instances, developed into useful practical applications in the arts and manufactures."

The Boston Society of Natural History has awarded the first Walker prize of $100 to Dr. Rudolph Ruedemann, assistant N. Y. State paleontologist, the subject of whose essay is the 'Hudson River formation of the vicinity of Albany, N. Y., and its taxonomic equivalents.' The paper will be published as a bulletin of the N. Y. State Museum.

At the meeting of the Paris Académie de Médecine on May 1st, Professors Behring (of Marburg), Golgi (of Pavia), Tilanus (of Amsterdam), and Pawloff (of St. Petersburg), were elected Foreign Associates.

Professors W. Pfeffer of Leipzig, von Richthofen of Berlin, and S. Schwendener also of Berlin, have been elected members of the Academy of Sciences of Christiania.

The following candidates have been selected

by the Royal Society for election into the Society: George James Burch, lecturer at University College Reading; T. W. Edgeworth David, professor of geology in the University of Sydney; John Bretland Farmer, professor of botany, Royal College of Science, London; Leonard Hill, lecturer on physiology, London Hospital Medical College; John Home, senior geologist of the Geological Survey of Scotland; Joseph Jackson Lister, demonstrator of comparative anatomy in the University of Cambridge; James Gordon MacGregor, professor of physics, Dalhousie College, Halifax, N. S.; Patrick Manson, physician and medical adviser to the Colonial Office; Thomas Muir, superintendent-general of education in Cape Colony; Arthur Alcock Rambaut, Radcliffe Observer, late astronomer royal of Ireland; William James Sell, senior demonstrator of chemistry, University of Cambridge; W. Baldwin Spencer, professor of biology in the Melbourne University, and James Walker, professor of chemistry, University College, Dundee.

THE Craggs Research Scholarship of £300 a year has been awarded to Dr. G. L. Low, M.A., M.B., C.M., of the London School of Tropical Medicine.

M. CORNU and M. Darboux Jean have been nominated as candidates for election to the permanent secretaryship of the Paris Academy of Sciences.

AN informal reception will be given to Dr. H. S. Pritchett, president-elect of the Massachusetts Institute of Technology, by the Technology Club, on June 5th.

MR. OTTO H. TITTMANN, assistant superintendent of the Coast and Geodetic Survey, will go to Alaska, where he will trace the boundary line established by the *modus vivendi* of October, 1899, between the British government and the United States. He will be absent for about two months.

PRESIDENT GILMAN and Professor Paul Haupt will represent the Johns Hopkins University at the celebration connected with the 500th anniversary of the University of Cracow on June 7th. Cambridge University will be represented by Dr. Alexander Hill and Mr. C. H. Monroe.

PROFESSOR HARRIS, of the department of geology, Cornell University, will take a class with the steam launch the *Orthoceras* to Lake Champlain for geological work.

DR. ALBERT B. PRESCOTT, dean of the pharmaceutical department of the University of Michigan, was elected president of the American Conference of Pharmaceutical Faculties at its first meeting held in Washington, May 11th.

SIGNOR MARCONI left Southampton for New York on May 26th. It is said that he will conduct extensive experiments on wireless telegraphy in this country.

JONAS GILMAN CLARK, the founder of Clark University at Worcester, Mass., died on May 23d, at the age of eighty-five years. Mr. Clark had no children and it is hoped that by his will Clark University will be adequately endowed.

GARDINER S. WILLIAMS, emeritus professor of the science and art of teaching at Cornell University, died on May 19th, at the age of seventy-two years.

THE death is announced of Dr. Edmund Atkinson, at the age of sixty-nine years. He was associated, as assistant to the late Sir Edward Frankland, with the early days of the chemical laboratory of Owens College, Manchester. Afterwards he was for many years professor of experimental science at the Royal Military College, Sandhurst, and at the Staff College.

DR. A. CLAUS, who recently resigned, on account of ill health, from the chair of chemistry, in the University of Freiburg i.B., died on May 7th, aged 60 years.

WE must also record the death at Ealing, England, of Brigade-Surgeon-Lieutenant-Colonel William Center. Lieut. Colonel Center joined the Indian Medical Department in 1865, and from 1871 served in the Punjaub as chemical examiner and professor in the Lahore Medical School. In 1882 he was statistical officer in the sanitary department of the Government of India, and afterwards received the appointment of civil surgeon, Lahore, and superintendent of the lunatic asylum. From 1888 until his retirement in 1893 he held one of the chairs at Lahore Medical College.

THE Croonian lectures before the Royal College of Physicians of London, will be delivered on June 19th, 21st, 26th and 28th, by Dr. F. W. Mott, F.R.S., pathologist to the London County Asylums, who has taken for his subject 'The Degeneration of the Neuron.'

A FIRE occurred in the Astronomical Observatory of Yale University on May 22d. Damage to the extent of about $500 was caused, and at one time the entire observatory was in danger. The fire was caused by a defective gas jet in the photographic room.

SEVERAL positions of a partly scientific character will be filled by a competitive examination in the State of New York on June 2d. These include an assistant commissioner of agriculture and a bridge designer in the office of the State Engineer and Surveyor.

As we have already announced, the University of Illinois has fallen heir to the Bolter Collection of Insects. The collection numbers approximately fifteen thousand species, represented by about seventy thousand specimens, besides thirty thousand duplicates not in the systematic collection. This collection, accumulated during the last fifty years by the late Andreas Bolter, a business man of Chicago, is remarkable for the excellence of the material and for the exquisite care with which it has been prepared and arranged. It represents all orders of insects and North America in general, and contains also a considerable amount of exotic material. The gift was made by the executors of Mr. Bolter, in accordance with the terms of his will, conditional upon its maintenance as a unit, under the name of the 'Bolter Collection of Insects,' in a fire-proof building.

THE valuable series of specimens collected by Mr. R. T. Günther in N. W. Persia, and described by him and others in the *Journal of the Linnean Society* (London) published last January is now incorporated with the collections of the British Museum.

A COMMITTEE of the Society for Plant Morphology and Physiology consisting of Professor Farlow, Dr. MacDougal, and Dr. Von Schrenk, will report to a business meeting of that body in New York in the last week in June upon the feasibility of securing an improved method of bibliographical reviews in botany.

THE Right Hon. W. H. Long, M.P., President of the British Board of Agriculture, has appointed a Departmental Committee to inquire into the conditions under which agricultural seeds are at present sold, and to report whether any further measures can with advantage be taken to secure the maintenance of adequate standards of purity and germinating power. The Committee will consist of the following members, viz: The Earl of Onslow, G.C.M.G., chairman; Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E.; Sir Jacob Wilson; Mr. R. A. Anderson, Secretary of the Irish Agricultural Organization Society; Mr. R. Stratton, The Duffryn, Newport (Mon.); Mr. Martin J. Sutton, Henley-park, Oxon.; Mr. James Watt, Knowefield, Carlisle, and Mr. David Wilson, Carbeth, Killearn, N. B. Mr. A. E. Brooke-Hunt of the Board of Agriculture, will act as secretary to the committee.

THE *Fourth Annual Report* of the New York Zoological Society contains besides reports of the Executive Committee, Director and Treasurer, a list of members, and the various acts relating to the Park, as well as a number of plates illustrating details of construction and installation and positions of the herds of elk and bison. The Society is to be congratulated upon the rapid progress it has made since assuming control of the grounds in August, 1898, and also upon the fact that every dollar has been expended to good advantage. It is to be hoped that it may succeed in increasing its membership and in securing the funds needed for the proper maintenance of the park. The number of animals in the park on Jan. 1, 1900, was 781, distributed as follows: mammals, 44 species, 151 individuals; birds, 43 species, 185 specimens; reptiles, 92 species, 445 specimens.

THE authorities of the British Museum have decided to adopt a system of hydraulic pressure upon all the fire mains of the institution as an additional precaution against fire. By the adoption of this system a pressure of water of enormous force will be obtained by the mere turning of a couple of wheels, and the necessity

for the fire engines which are at present on the roof of the museum will be obviated.

THE new British National Physical Laboratory will not be erected on grounds belonging to Kew Gardens as has been stated but on crown land outside the Gardens.

THE coming meeting of the American Association will offer several special features to the botanists. Among these we note that Section G. will be the guests of the New York Botanical Garden on Wednesday, June 27th, on which date the Torrey memorial program will be given in the lecture hall of the museum of the Garden. The special features of this program have been noted in a previous number of this JOURNAL. The Section and the Botanical Society of America will hold a joint session on Thursday, June 28th, in which the program of the latter including the president's address will be given. A general discussion of the plant geography of North America has been arranged for Friday, June 29th, in which Dr. F. V. Coville, Dr. John Macoun, Professor B. L. Robinson, Dr. John K. Small, Professor W. A. Kellermann, Dr. Roscoe Pound, Dr. H. C. Cowles, Dr. P. A. Rydberg, Dr. J. N. Rose, Professor C. V. Piper, Professor W. L. Bray, Mr. T. H. Kearney, Dr. N. L. Britton and perhaps one or two foreign botanists will participate. The last general presentation of this subject in a systematic manner was given at the Indianapolis meeting in 1890, since which time such advances have been made in the development of the principles that govern plant distribution, and in the collation of facts from the careful study of the flora that the coming symposium is bound to be of great interest and lasting value.

UNDER the auspices of the Boston Society of Natural History, a series of courses in natural history, including geology, zoology and botany, will be given at Bayville, Linekin Bay, Maine, beginning Friday, July 6, 1900, and continuing for three weeks. The object of these courses is to teach the elements of natural history by observation in the field and laboratory under trained instructors, and to furnish opportunity for more extended work in one or more of the branches taught, to those who desire it, under the guidance of the instructors. Mr. A. W. Grabau, of Rensselaer Polytechnic Institute, will give instruction in zoology; Mr. Freeland Howe, Jr., of Harvard University, in zoology, and Mr. C. E. Preston, assistant in Harvard University, in botany. Further particulars may be obtained by addressing Mr. A. W. Grabau, Boston Society of Natural History, Boston, Mass.

THE New Mexico Biological Station, conducted by Professor T. D. A. Cockerell and Miss Wilmatte Porter, will be in session at Las Vegas during June and July. Special attention will be given to the local plants and insects.

A FEW years ago it was necessary to import from abroad most of the scientific apparatus required for instruction and research. At present such apparatus is to a large extent made at home, and there are indications that it will soon be exported to a considerable degree. Thus Messrs. Queen & Co., of Philadelphia, have recently received an order from a foreign government for two Ruhmkorff induction coils which will be the largest ever made. The celebrated Spottiswoode coil, built under the auspices of the Royal Society, gave a spark of 42 inches. The Queen coils are to give a spark of 45 inches, expending an energy of 3 to 4 horsepower, and having a potential of half a million volts.

AT a meeting of the Zoological Society of London on May 8th, Mr. J. S. Budgett, F.Z.S., read a paper entitled 'Some Points in the Anatomy of *Polypterus*,' as deduced from an examination of specimens lately procured by the author in the River Gambia. The urinogenital organs of the male and female *Polypterus* were described in detail; those of the male, it was believed, for the first time, while the description now given of the genital ducts in the female did not entirely agree with those of previous writers. The later stages in the formation of these organs were also described, and it was shown that the condition found in the Ganoid *Lepidosteus*, where the products of the testis are carried away by the tubules of the kidney, was not primitive. Some new points of interest in the vascular system were communicated, and reasons were given for not regarding the external gill of *Polypterus* as homologous with the hyoidean pseudobranch of *Acipenser*, but rather

with the external gill of the Dipnoi and the Amphibia. The formation of the abdominal pores of *Polypterus* was also described, and the use of the enlarged anal fin of the male in the breeding-season was discussed.

UNIVERSITY AND EDUCATIONAL NEWS.

THE wills of John Nicholas Brown and Harold Brown were filed in Newport on May 22d. Brown University receives $25,000 from them each. J. N. Brown leaves $150,000 for a library building and $500,000 for an endowment, the place of the library to be selected by the trustees. Both wills contain a number of charitable bequests.

WASHINGTON AND LEE UNIVERSITY receives $3000 for a scholarship by the will of the late Mrs. Juliet S. Bradford.

THE entomological collection belonging to the late Dr. J. A. Lintner, for many years State entomologist, is to be given to Cornell University by his widow as a memorial to her husband.

MR. THOMAS ANDREWS, F.R.S., has given to the Chemical Laboratory of Cambridge University one of the Echelon spectroscopes, invented by Professor A. A. Michelson.

A DORMITORY is being erected by Cornell University on the tract of land in the Adirondacks, used in connection with the School of Forestry.

IT is said that a commercial university will soon be established at Hamburg with all the rights of the German universities and technical schools. Provision will be made for chairs in all scientific subjects connected with commerce.

ON May 9th, the Convocation of Oxford University established the new degrees of Doctor in Science and in Literature. Now it will no longer be necessary for graduates in science of this ancient seat of learning to take the examinations of London University for the sake of obtaining a doctorate. Thus the impulse given to research will be both direct and indirect.

MR. BALFOUR has consented to give the inaugural address at the summer meeting for University Extension students and others to be held at Cambridge in August. The meeting will last from August 2d to 27th, and during that time over one hundred lectures will be delivered upon different aspects of life and thought in England in the nineteenth century. Amongst those who will lecture are Professor Jebb, M.P., Professor A. V. Dicey, Professor Clifford Allbutt, Dr. Augustus Jessopp, the Master of Trinity, Sir Robert Ball, Professor J. J. Thomson, the Bishop of Southampton, Sir Joshua Fitch, and the Dean of Ely.

A REQUISITION addressed to Lord Balfour is being signed, asking him to allow himself to be nominated for the chancellorship of St. Andrews University, vacant by the death of the Duke of Argyll. The appointment rests with the general council of the University, and is held by the occupant for life.

MR. LAURENCE EDMONDS GRIFFIN, Bruce Fellow and candidate for the degree of Doctor of Philosophy this year at the Johns Hopkins University, has been appointed instructor in biology in the College for Women of the Western Reserve University, in the place of the late Dr. N. R. Harrington.

ALICE W. WILCOX, instructor in biology at Vassar College, has been appointed by the faculty to hold the Babbott Fellowship for 1900 1901 and will do graduate work in biology at the University of Chicago.

SEVERAL changes have recently taken place in the medical staff of University College, London. Dr. Sydney Ringer has retired from the Holme professorship of Clinical Medicine, and has been succeeded by Dr. F. T. Roberts. Mr. Christopher Heath has resigned the Holme professorship of Clinical Surgery and is succeeded by Mr. Rickman J. Godlee. Dr. Roberts on taking up the Holmes professorship has resigned the professorship of the principles and practice of medicine, and the council have selected Dr. G. Vivian Poore to succeed him.

DR. JOHN WYLLIE has been elected professor of medicine in the University of Edinburgh in succession to the late Sir Thomas Grainger Stewart.